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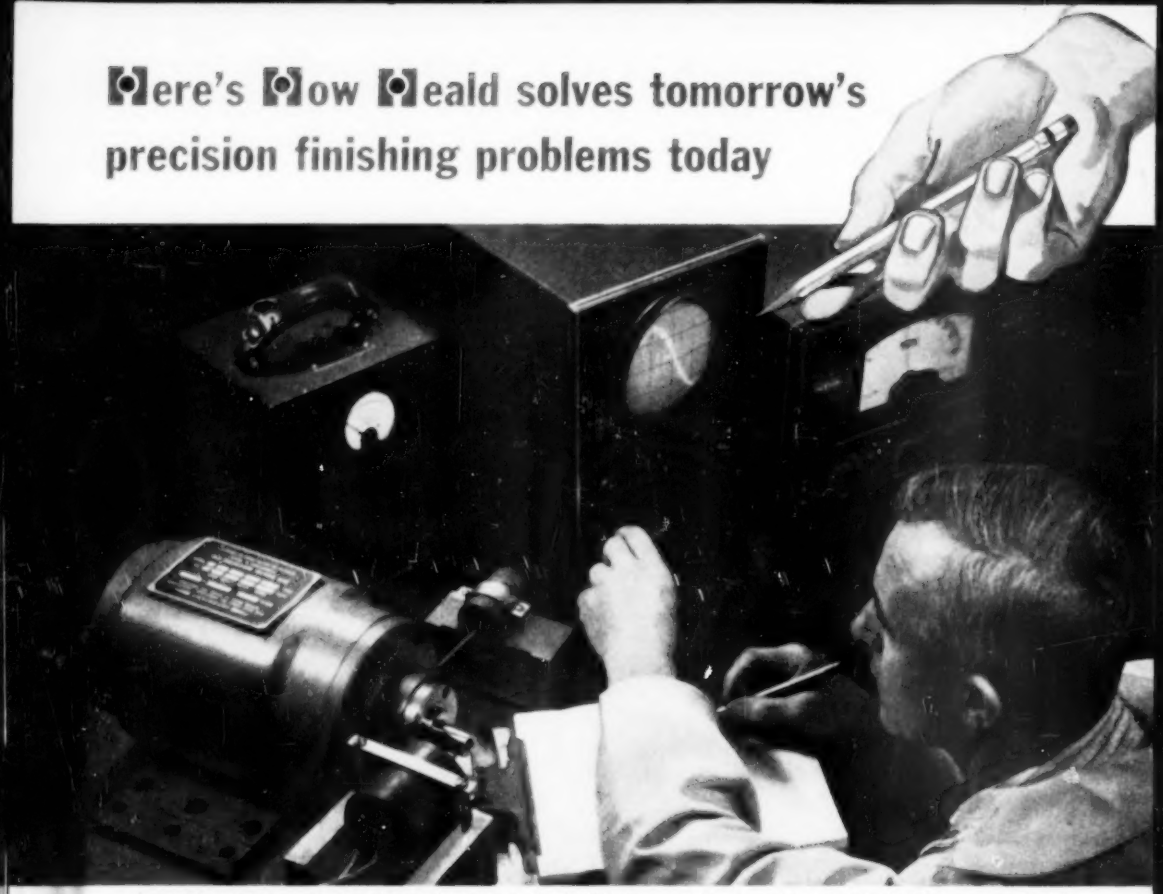
American Machinist

JULY 7, 1952

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Here's How Heald solves tomorrow's precision finishing problems today



A research technician studies the vibration characteristics of a Heald grinding spindle mounted in a Red Head Hi-Frequency wheelhead.

Making good equipment still better is a never-ending job in Heald's far-sighted research department

Heald research engineers are never satisfied. To them, the best is never quite good enough. That's one important reason why Heald machines have consistently set the pace for faster, easier and better production of precision finished parts.

Yesterday's research is now helping manufacturers everywhere to perform daily miracles of speed and precision in the critical switch from peace-time to defense production. And today's research holds the key to tomorrow's production problems — whatever the picture may be.

The Heald research laboratory is completely equipped with the finest of precision instruments — for measuring size, hardness, surface finish, temperature, vibration, pressure and viscosity. Still more important, however, is the specialized experience of the men who use them. For it is their skill that translates test results into practical design improvements. Remember — when it comes to precision finishing, it pays to come to Heald.

HEALD

Heald machines speed the nation's production

THE HEALD MACHINE COMPANY

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American Machinist

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Chips and QUIPS

Union . . . Behind the guns, the planes and the ships that make America strong there must be a similarly strong industry. Metalworking. So we've taken the shield so familiar as an American emblem for our cover motif and shown in its 13 stars the 13 basic processes that make up Metalworking, and over the stripes some typical defense products. The stripes themselves might well stand for the 13 major subdivisions of Metalworking, for all are involved with the armament-production program. In *this* union there *is* strength for America.

The 13 processes? They are: forging, forming, casting, drilling, turning, shaping and planing, grinding, milling, inspection, finishing, assembly, plastics, handling. Incidentally, we had some questions about the propriety of using the shield in this way, so we checked with the Post Office. They reported they have no jurisdiction. Then one of our editors, who formerly lectured on flag etiquette, explained that it is improper to do anything with the flag or the Great Seal that would show disrespect or alteration; both must be displayed in strict accordance with international custom. But bunting or the shield (which is *not* exactly the shield on the eagle's breast in the Great Seal—see the back of a dollar bill) can be modified.

We thought the idea was a powerful editorial in a picture, and something every man in Metalworking should have constantly in mind. Independence Day is, we think, a good time to point it out.

Big Investment . . . D F B Tedds of Bristol Aeroplane, Ltd, England, tells about the largest "lost-wax" castings we've heard of, and among the most intricate. They're in Nimonic and other high-temperature alloys.

Metal-to-Glass . . . Our Special Report started as a modest article by Sam Wein, metallizing consultant of New York. Then pictures and data were added until it grew to a full-fledged eight pages on the techniques for bonding metal to ceramics, glass and plastics and methods for printed circuits.

Dies . . . J A Thomson, head of the Short Order Dept, South Wind Div, Stewart-Warner, gives us two stories in one: how his department operates and how zinc alloy makes temporary dies.

Flat Zig-Zag . . . One big headache in aircraft is violent fluctuation in shop load. Northrop has a new plan for shop loading that licks this headache, both for the individual machine and for the plant in general. D R Huisk, of the Manufacturing Control Div, tells the story of the data assembled on machine capacities, on load, and on how to re-schedule to iron out peaks. It eases problems of manpower, storage, tool crib, transportation, and operation.

Die Quenching . . . Form-die quenching is a new method for forming accurate contours in high-strength aluminum alloys. Combining forming and quenching in the same press operation avoids the distortion that normally occurs during water quenching. Heavy stock, previously impossible to form, now can be. Savings on jobs formerly formed by other methods ran as high as 75%. Joseps S Corral and Lyle R Boarts of machine forming at North American Aviation tell about it.

High Angle . . . We've been waiting to pounce on details of work done at Cincinnati Milling Machine on high-angle milling. The story—at last—herewith.

Coming . . . *AM* for July 21 will include an unusual Special Report on bending extruded shapes, plus a very special lead article on ceramics. Other articles cover the bonding of aluminum to steel, use of vacuum, manufacture of 20-mm shell, punch-press guards, and the effect of drawing on stainless wire.

JOSEPH S CORRAL

METAL-FORMING AUTHORITY . . . Joseph S Corral, general foreman of machine forming since 1946, has been with North American Aviation, Inc, for 14 years. During World War II, was asst supt of Sheet-Metal Fabrication, in charge of all sheet-metal manufacturing. He is known as an authority and has addressed such groups as the SAE on forming. He also played a major role in development of stretch forming. He co-authored our current article on die quenching with . . .

LYLE R BOARTS

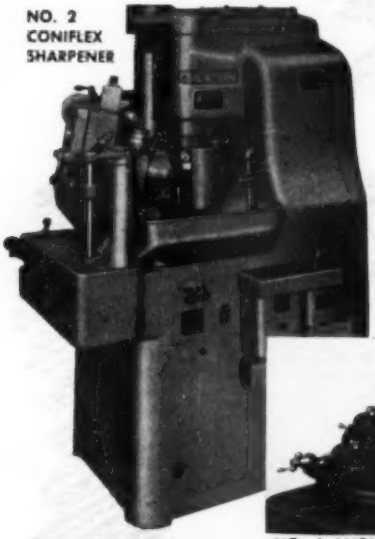
FORM-DIE QUENCHER . . . Lyle R Boarts is foreman of machine forming at North American. With the company for 15 years, he is only 33, yet is recognized as a competent authority on forming. He played a major role in the development of form-die quenching, and also invented some revolutionary forming aids on rubber-forming presses.

SMALL CONIFLEX® GEARS

NO. 2
STRAIGHT BEVEL GENERATOR

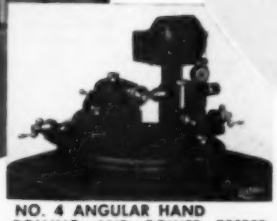
Coniflex® gears in the smaller sizes are cut on the Gleason No. 2 Straight Bevel Generator. Like the larger Coniflex® gears, these gears are cut to the same fine degree of accuracy with operating tolerances which make them easier to assemble and smoother to operate. Gears cut on the No. 2 have a localized tooth bearing that insures the proper bearing position during operation. When production demands require it, the No. 2 can be equipped with an automatic loader.

NO. 2
CONIFLEX
SHARPENER



The No. 2 Coniflex® Sharpener is a specially designed wet-type grinder to handle the disc type interlocking cutters used on the No. 2 Straight Bevel Generator. The cutter oscillates under the grinding wheel and is indexed automatically until all the blades have been sharpened.

For testing of the running qualities of small Coniflex® gears the Gleason No. 4 Angular Hand-Rolling and Power Tester, is the machine to complete the unit for small bevel gear production.



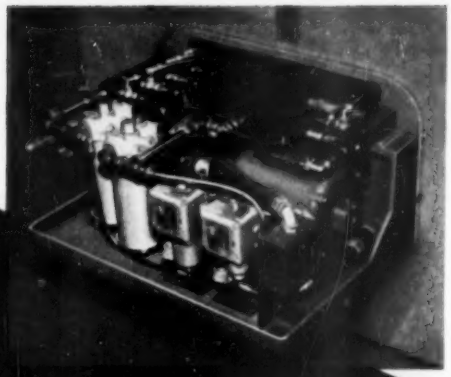
NO. 4 ANGULAR HAND
ROLLING AND POWER TESTER

BUILDERS OF BEVEL GEAR MACHINERY · FOR OVER EIGHTY-FIVE YEARS · GLEASON

GLEASON WORKS

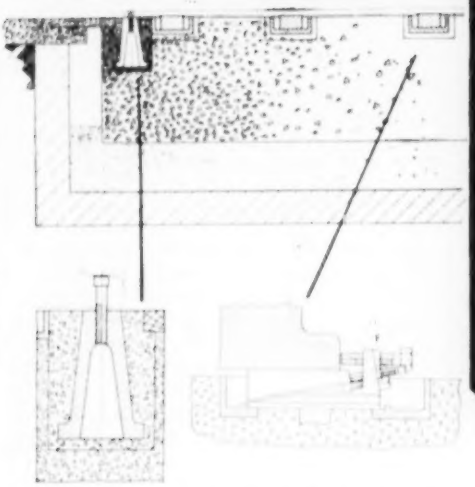
1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

Motor, pump and filters for pressure lubricating system for table and wheelhead ways.



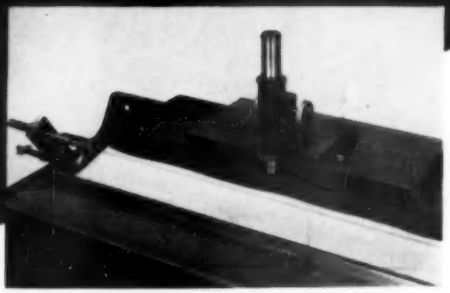
Answer to the $64.00 question

...How to reduce down time in your shop



Anchor bolt in foundation prepared especially for the machine.

Leveling blocks should be embedded in the concrete foundation before the machine arrives.



Microscope Aligning Instrument for checking accuracy of table way alignment.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES

One of the best ways to keep production going is to eliminate work stoppages caused by down time of machines. In most cases, this can be done through routine checkups and preventive measures. The following suggestions apply in general to most large centertype grinders, and in particular to CINCINNATI FILMATICS within 14" to 28" sizes:

WHEEL BALANCE If you are getting a poor finish, do not assume that the FILMATIC grinding wheel spindle bearings need attention; over 99% have never required maintenance or adjustment. Check other contributing factors . . . way lubricant, V-belts, type of wheel, and especially wheel balance (for machines which are not equipped with Automatic Wheel Balancing). Perfect balance is absolutely necessary for high-quality finish.

FOUNDATION Adequate foundations for long precision grinding machines are very necessary. Follow the recommendations outlined in foundation plans supplied with large CINCINNATI FILMATIC Grinding Machines.

LEVELING AND ALIGNMENT Improperly leveled and aligned machines can be the source of many troubles. Leveling blocks are supplied to facilitate this operation. Periodically recheck accuracy of level. When installing the machine, accurate alignment can be accomplished with the aid of a Microscope Aligning Instrument.

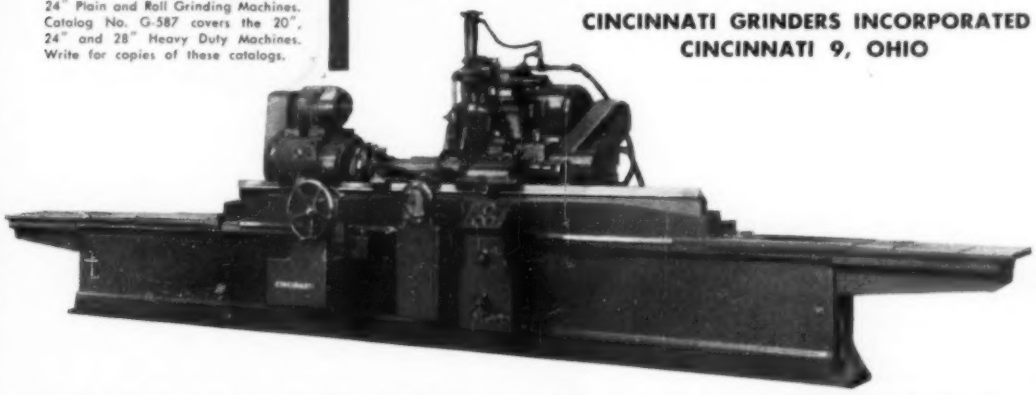
LUBRICATION of your CINCINNATI FILMATIC Plain and Roll Grinding Machines is simple and easy; do not neglect it. As a reminder, make a lubrication chart and attach it to your machine.

OIL FILTERS There are three oil filters—one for the FILMATIC spindle bearing lubricating system, and one each for the table way and wheelhead way oil. All are the replaceable type. Change them periodically; once a year should be sufficient.

If you will take these simple preventive measures, you will be well repaid in accurate, dependable performance for many years . . . performance that will match the lifetime dependability of FILMATIC spindle bearings. And if you're not acquainted with the many advantages offered by the large centertype grinders built by CINCINNATI, write for literature mentioned in the caption at the left.

CINCINNATI FILMATIC 16" x 96" Roll Grinding Machine, equipped with automatic wheel balancing and profile grinding wheel truing. Catalog No. G-600 contains complete specifications for the 16" Heavy Duty and 20" and 24" Plain and Roll Grinding Machines. Catalog No. G-587 covers the 20", 24" and 28" Heavy Duty Machines. Write for copies of these catalogs.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

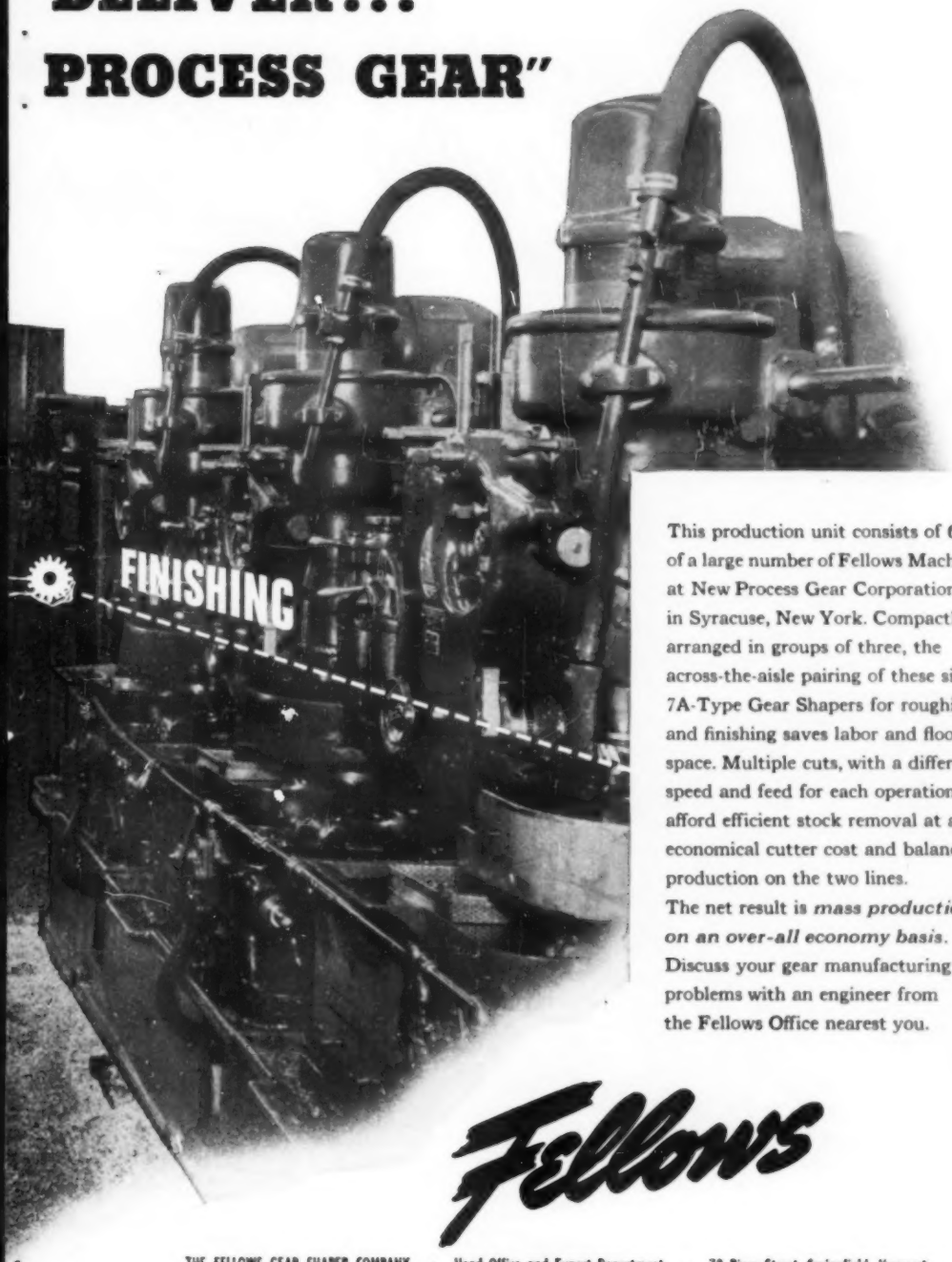
FELLOWS MACHINES AT "NEW

GEAR SHAPER PERFORMANCE

	ROUGHING	FINISHING
General Description	External Cluster Gear	Same
Material	SAE 4027	Same
Number of Teeth	27	Same
Pitch	7/9	Same
Helix Angle	23° 13" R.H.	Same
Pressure Angle	20°	Same
Face Width	1.000 inch	Same
Number of Cuts	3-cut cam	2-cut cam
Cutter Spindle Speed	450 strokes per min.	300 strokes per min.
Feed	.016" per stroke	.024" per stroke
Production Rate per machine	7 Pieces per hour	7 Pieces per hour

Production rate is floor to floor, and is based on 85% efficiency.

DELIVER...
PROCESS GEAR"



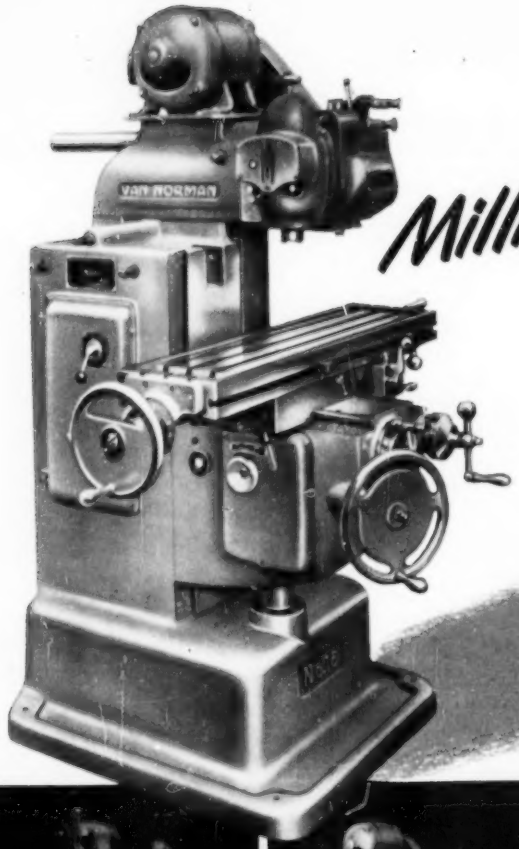
This production unit consists of 6 of a large number of Fellows Machines at New Process Gear Corporation in Syracuse, New York. Compactly arranged in groups of three, the across-the-aisle pairing of these six 7A-Type Gear Shapers for roughing and finishing saves labor and floor space. Multiple cuts, with a different speed and feed for each operation, afford efficient stock removal at an economical cutter cost and balanced production on the two lines.

The net result is *mass production on an over-all economy basis*. Discuss your gear manufacturing problems with an engineer from the Fellows Office nearest you.

Fellows

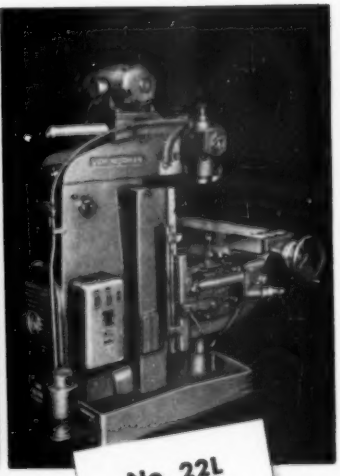
THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

Milling Production Simplified



No. 12
Table: 37½" x 9½"
Cutterhead in
Angular Position

No. 16
Table: 37" x 9½"
Cutterhead in
Horizontal Position



No. 22L
Table: 45" x 10"
Cutterhead in
Vertical Position

VAN NORMAN

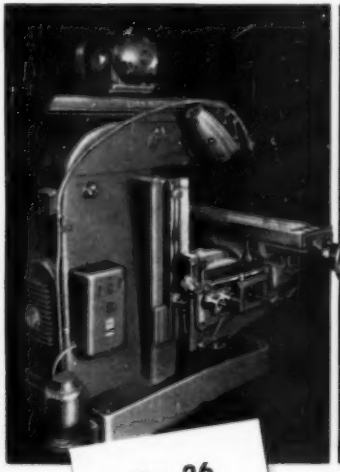
is Speeded, and More Accurate with

VAN NORMAN
Ram-Type Millers

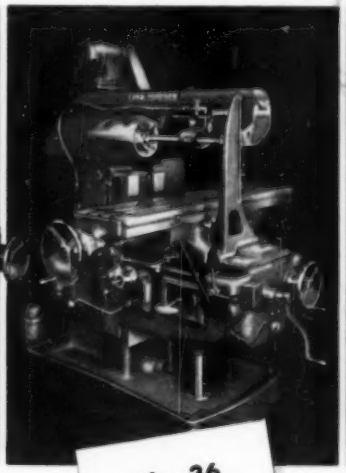
Equip your toolroom and production lines with modern Van Norman Ram-Type Millers that provide new ease of set-up and control . . . smoothness in operation on the heaviest of cuts . . . and plenty of weight and power to keep on turning out work of highest accuracy under the strenuous schedules that today's conditions impose.

Featuring the adjustable cutterhead and movable ram, these Millers enable the operator to go from vertical to angular to horizontal milling with a minimum of resetting of work and with standard arbors and cutters. Operation is simplified because the controls are placed right at the operator's fingertips. Rigidity to maintain accuracy on the heaviest cut is assured by the balanced design of each machine.

All these features sum up to the highest output, fewest errors, lowest milling cost and machine maintenance. Find out how Van Norman Ram-Type Millers can save on your work. Write for catalogue.



No. 26
Table: 58" x 13"
Cutterhead in
Angular Position

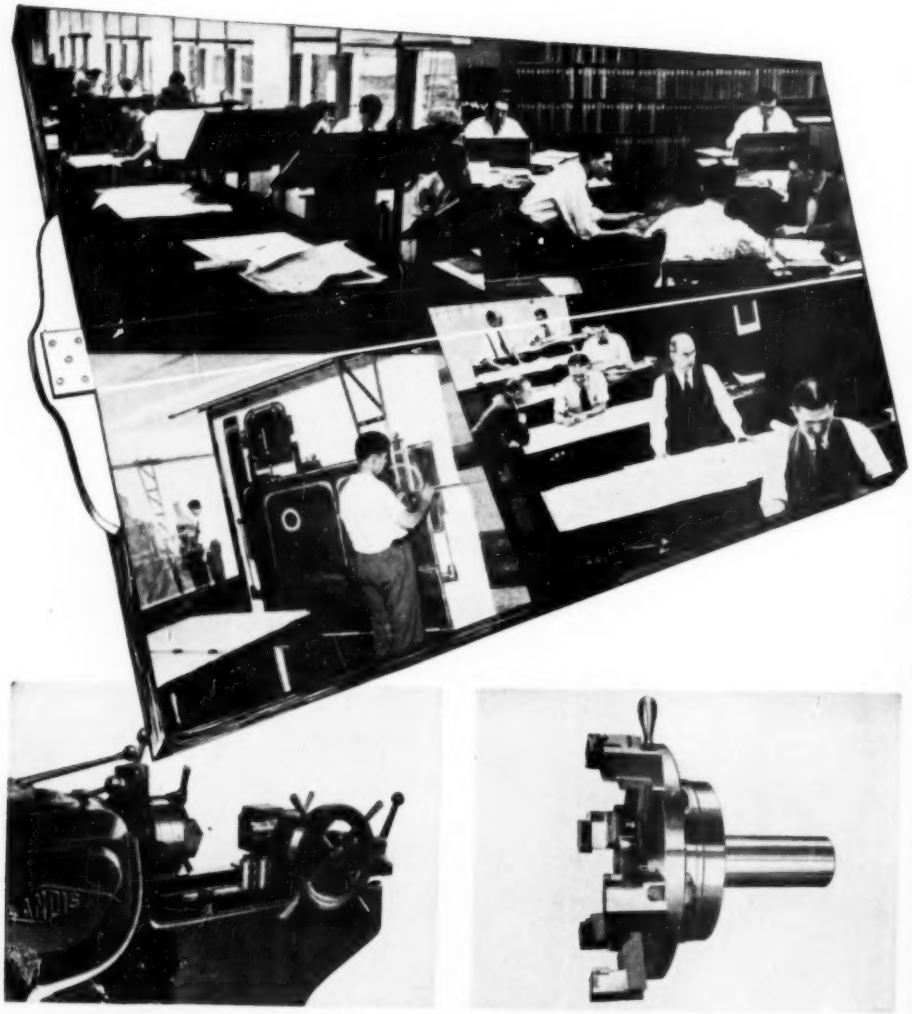


No. 36
Table: 64" x 14"
Cutterhead in
Horizontal Position

No. 38
Table: 64" x 14"
Cutterhead in
Horizontal Position

COMPANY, SPRINGFIELD, MASSACHUSETTS, U. S. A.

A COMPLETE *Thread*



A 1½" Single LANDMACO Machine equipped with special work holding fixture for threading adapter sleeves.

A Special Die Head (LANDMATIC 40AXX) designed and built to thread valve seat rings up to diameters of 14¾".

● *THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS*

Engineering Service

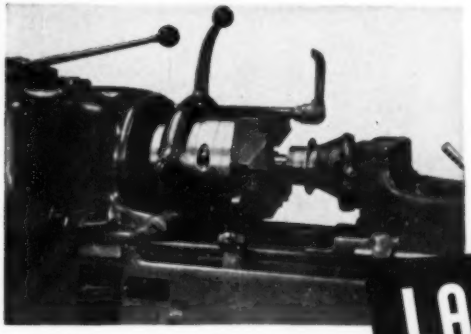
- **PRODUCT DESIGN**
- **PROCESS DEVELOPMENT**
- **ALL TYPES OF THREADING EQUIPMENT**
- **SPECIAL APPLICATIONS**

New and improved products often create unprecedented threading problems—both in design and production. Realizing this, we offer all manufacturers the help of our Thread Engineering Service in efficiently and economically solving their Thread Problems.

The difficulty may be in designing a thread which will function properly as an operating part, or in producing a thread already designed. Whatever the problem our Engineering Department is ready to help with advice and assistance—or to undertake the solution alone.

After examining all phases of the problem, the necessary recommendations will be made on basic Thread Design, the production process, and the Threading Equipment that should be used. For example, often a difficult Thread Production problem can be solved with a slight change in basic Thread Design. Occasionally, a job is so unique that special equipment is needed—three such Special Equipment Applications developed by our Engineering Department are illustrated below.

Whatever your Thread Problem, use our THREAD ENGINEERING SERVICE. Hundreds of manufacturers have been able to perform difficult threading operations efficiently and economically with Landis Threading Equipment. The years of Thread Experience and Engineering Know-How that has brought LANDIS to the fore in Thread Generating is at your service. May we help you?



A 1½" Single LANDMACO Machine equipped with special carriage front for threading axle housings.

OF THREAD GENERATING

LANDIS Machine COMPANY
WAYNESBORO, PENNSYLVANIA

EQUIPMENT

Electrolux Increases Armature

Landis 4" Plain Grinders replace equal number of older machines

Here is another example showing how Landis grinders have improved production and lowered costs.

Armature shafts at Electrolux were formerly ground on older machines which required time-consuming hand operations. The new Landis 4" type H plain

Landis 4" Type H Plain Grinder

Ask for Catalog A-49

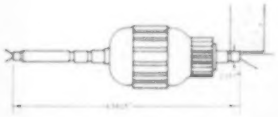
LANDIS

precision grinders

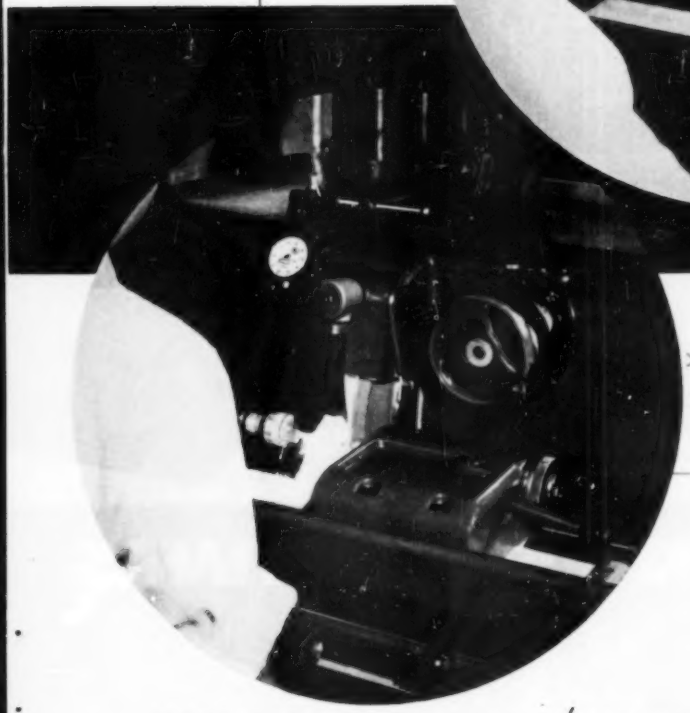
Grinding Output 40%

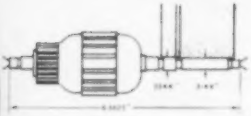
grinders with hydraulically operated rapid wheelbase movement, slow grinding feed, timed cycle and visual sizing gauges have made these gains possible.

Whatever your grinding problem—our engineers will be glad to make production estimates and tooling suggestions from your work prints.



work data	
PRODUCTION	350 pieces per hour
OPERATION	grind small bearing
STOCK REMOVAL	.012" to .015"
TOLERANCE	.0002" on diameter





work data	
PRODUCTION	210 pieces per hour
OPERATION	grind large bearing and fan diameter
STOCK REMOVAL	.012" to .015"
TOLERANCE	.0002" on diameter

151

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

NOW
for delivery* in 1952
a limited number of 5" horizontals (G & L 50-T's)

THIS year — if you act soon — you can count on delivery of a famous Giddings & Lewis No. 50-T, Table-Type Horizontal Boring, Drilling and Milling Machine.

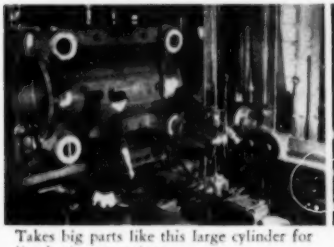
You'll find this rugged, multi-purpose machine will bore, drill and mill with equal precision and speed . . . that it will handle hundreds of jobs — large or small, simple or complex. Check the specifications at the right.

And . . . *if you get your order in soon* because only a limited number are available . . . YOU CAN GET DELIVERY THIS YEAR! See your nearest G&L representative or contact factory direct.

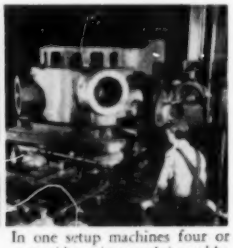
IDEAL FOR OPERATIONS LIKE THESE

Face milling die bolster block. No pre-layout needed.

Contour milling using right angle attachments, revolving table with power take-off.

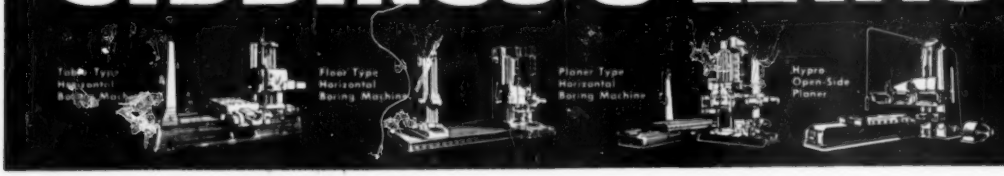


Takes big parts like this large cylinder for line boring operations.



In one setup machines four or more sides using revolving table.

GIDDINGS & LEWIS



SPECIFICATIONS

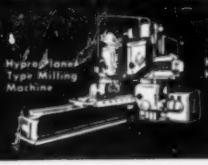
The 50-T is available only with the following specifications

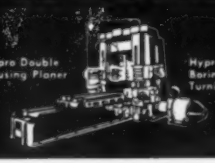
Spindle diameter	5"
Speeds to spindle	24
Range of speeds to spindle	6 to 300
Feeds to spindle	24
Range of speeds to spindle	.004" to .609"
Milling feeds (headstock, table, saddle)	18
Range of milling feeds (in. per rev. of spindle)	.004" to .609"
Working surface of table	60" x 96"
Cross travel of table	84"
Working height of column	60"
Length of Bed	120"
Motor	20 hp.

For complete details and specifications on the Giddings & Lewis 50-T see your nearest G&L representative. Ask for Bulletin No. 5.

*Delivery date pertains only to this specific machine and the quotations are subject to prior sale and allocation of priorities as established by N.P.A.

MACHINE TOOL CO.


Hypro Planer-Type Milling Machine


Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN

Van Keuren

ROOT DIAMETER MEASURING WIRES...

IF you want to know the root diameter of a screw thread, use Van Keuren Root Diameter Measuring wires.

They are 50° included angle and will fit into 55° or 60° threads from 4½ to 64 threads per inch. They are 1¼" long and .150" from base to apex of the triangle.

They are $28.75 per set of 3. One set will measure most all of your threads.

Complete specifications and formulas for using all kinds of Van Keuren Measuring wires for threads, gears, splines, dovetails and angles are given in the Van Keuren 1952 Catalog and Handbook No. 35.

...WRITE FOR YOUR COPY

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

33rd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

GARDNER

precision disc Grinders

Two Operations—One Handling

Accuracy and Finish Improved Grinding Axle Shaft End

A large automotive builder uses this two-head type 723 Gardner grinder to rough and finish grind the splined end of axle shafts. The rotary work carrying fixture locates and clamps the axle in a rotating chuck.

This new method improves finish and holds closer tolerances.

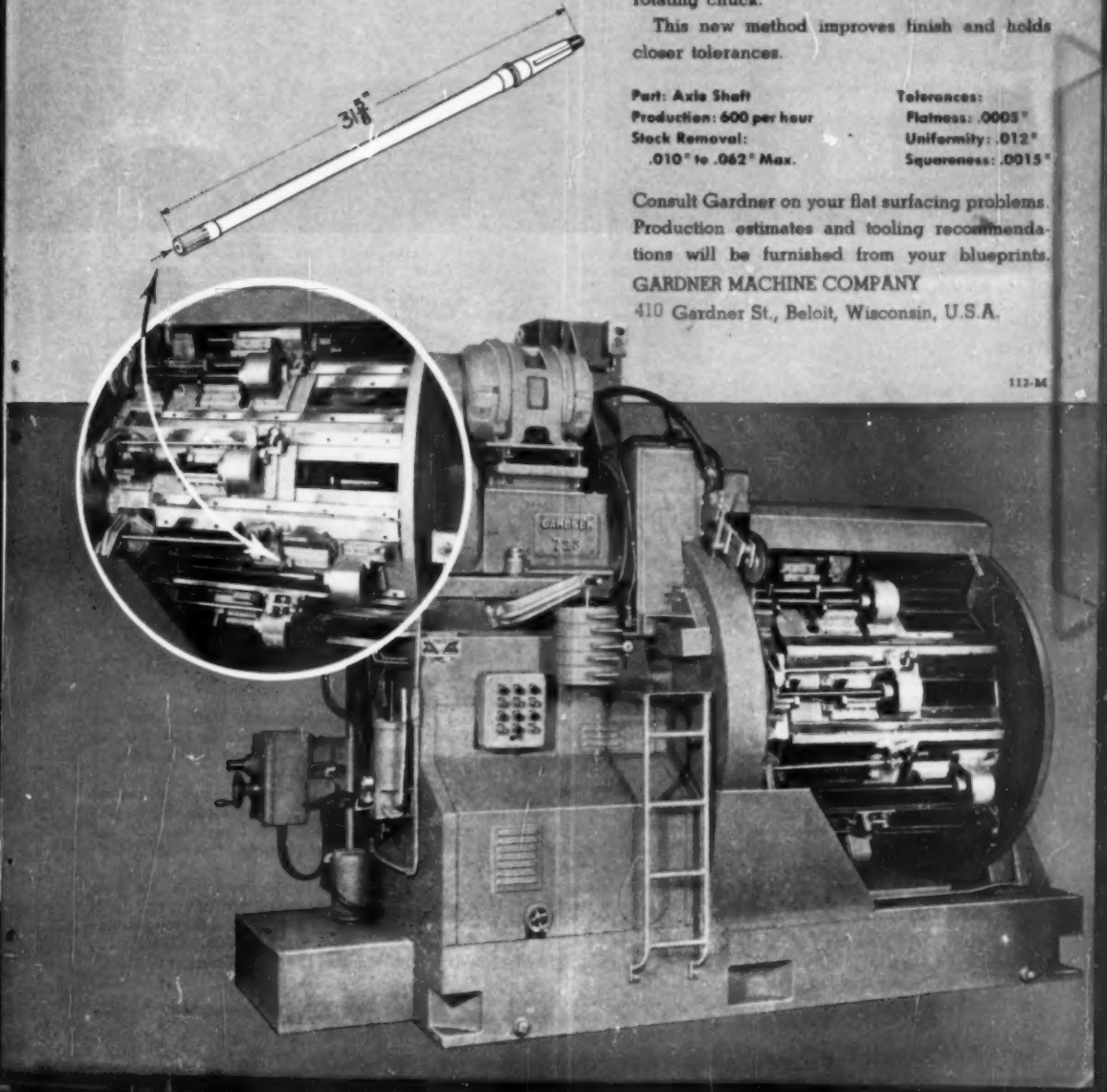
Part: Axle Shaft
Production: 600 per hour
Stock Removal:
.010" to .062" Max.

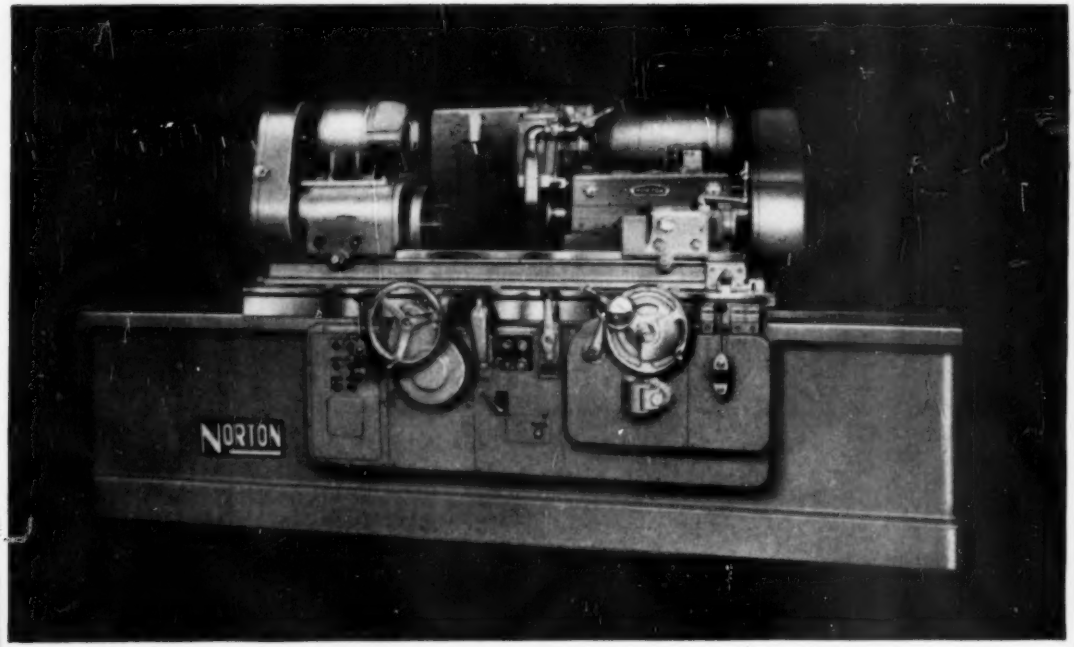
Tolerances:
Flatness: .0005"
Uniformity: .012"
Squareness: .0015"

Consult Gardner on your flat surfacing problems. Production estimates and tooling recommendations will be furnished from your blueprints.

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U.S.A.

112-M





NORTON 10" TYPE CTU Semiautomatic Grinder is first choice on production lines and in job shops. No other cylindrical grinder offers you such a unique combination of speed, accuracy, flexibility and sturdiness. No wonder users have reported that Norton 10" CTU's have doubled production . . . replaced 2 or 3 machines . . . eliminated extra operations . . . made operators more productive. *Catalog No. 1787* gives you complete data about sizes, advantages, features and optional equipment that help you put extra profits into your production. It will pay you to look into the high-speed, high-finish grinding this machine makes possible.

You get better and faster cylindrical

with Norton Type CTU Semiautomatics

Heavy stock removal?
Consistently fine finishes?

You get either or both . . . easier and faster . . . with a Norton CTU Semiautomatic Cylindrical Grinder.

It's easy to see why. Your operator loads the work . . . *touches one lever* . . . and stands by while the machine does the rest . . . as easy as 1-2-3.

Work is automatically ground to size under electric timer control . . . and the wheel head resets itself for the next cycle.

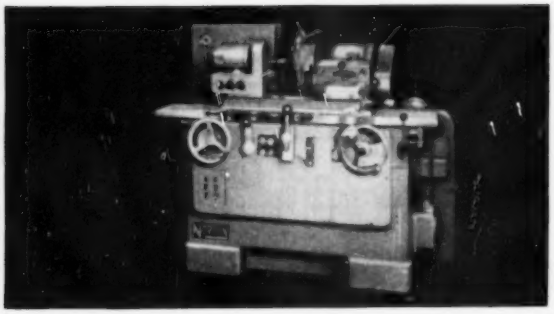
All three basic Norton CTU Semiautomatic Grinders: 4", 6", and 10", offer you the same advantages over their different ranges of work sizes. You can also get the 6" grinder with a 10" swing and the 10" grinder with a 14" swing by specifying Type LCTU. The Norton line of Type CTU Cylindrical Grinders also includes plain machines for traverse grinding. Your Norton Representative will be glad to help you choose the one that best fits your requirements.

Norton Cylindrical Grinding Machines are just one phase of *the world's most complete line of grinders and lappers* . . . products of Norton's engineering leadership in both grinding wheels and machines.

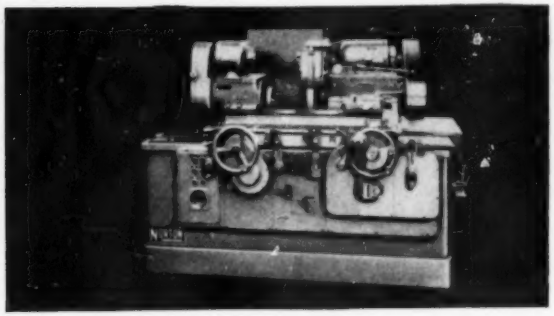
Remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

Norton welcomes opportunities to work with you on the planning level to fit standard or special grinding machines into your plans for "post emergency" production.

For complete information, see your Norton Representative or write us direct for the catalogs listed under the machine illustrations. NORTON COMPANY, Machine Division, Worcester 6, Mass.



NEW NORTON 4" TYPE CTU Semiautomatic Grinder in 12" and 18" work length capacities now makes it practical for you to apply Type CTU high-speed, high-finish grinding to small parts. *Catalog No. 531* gives you full details.

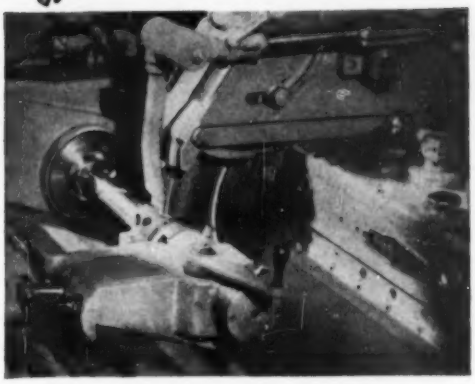


NORTON 6" TYPE CTU Semiautomatic Grinder, in 18" and 30" work length capacities, has a performance record that's worth investigating. *Catalog 1488* tells the whole interesting story.

grinding

EASY AS 1-2-3

1. Operator loads machine and touches starting lever.



2. Machine automatically grinds part to required size and finish — while operator attends another machine.

3. Operator unloads machine.

To Economize Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

facts tell the story { NEW KEARNEY & TRECKER MILWAUKEE CK USER BIG

THE FACTS ON THIS JOB ARE:

Machine: New 25hp No. 5, Model CK Plain.
Material: Cast Steel, 150 Brinell.
Feed: 4½ inches per minute.
Cutter Speed: 100 surface feet per minute.
Rate of metal removal: 17.5 cu. in. per min.
Production rate: 4 parts per hour.

NOTE: Each part requires but a *single pass* of the cutters on the new Kearney & Trecker CK machine.

Old production rate: 1¼ parts per hour—two passes required per piece.

MILLING MACHINE PAYS PRODUCTION DIVIDEND

NEW 25HP CK PLAIN MACHINE OUT PRODUCES PREVIOUS MACHINE NEARLY 4 TO 1!

CK MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

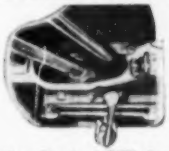
Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

New CK machines have Greater Horsepower. On this job, 25hp enabled operator to get maximum production from his cutters.

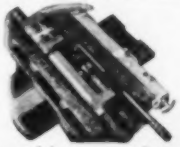
No. 60 heavy-duty drive flange around spindle nose permitted use of an extra-rigid heavy-duty arbor on this multiple cutter setup.

CK's 3-bearing spindle and flywheel assure Maximum Cutter Efficiency. On this job it meant fast metal removal and smooth finish in a single pass.

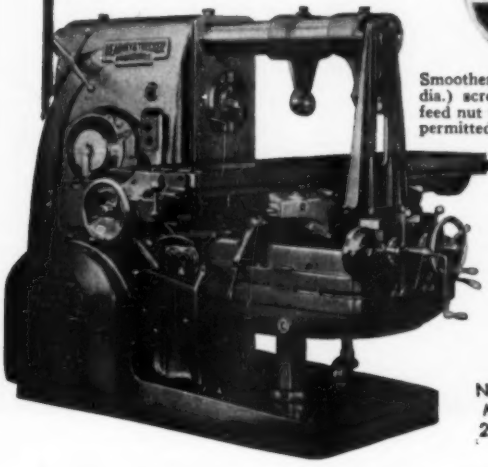
The new Kearney & Trecker CK milling machine doing this job has 24 different spindle speeds (13 to 1300 rpm.) Its 32 different table feeds range from ¾" to 90" per minute. Thus operator was able to *pick exact speed and feed* to get fullest advantage from high horsepower and modern cutting tools. This meant Greater Productivity on this job.



Smoother Feed of CK's large (2" dia.) screw and extra-long table feed nut with backlash eliminator permitted heavy cut.



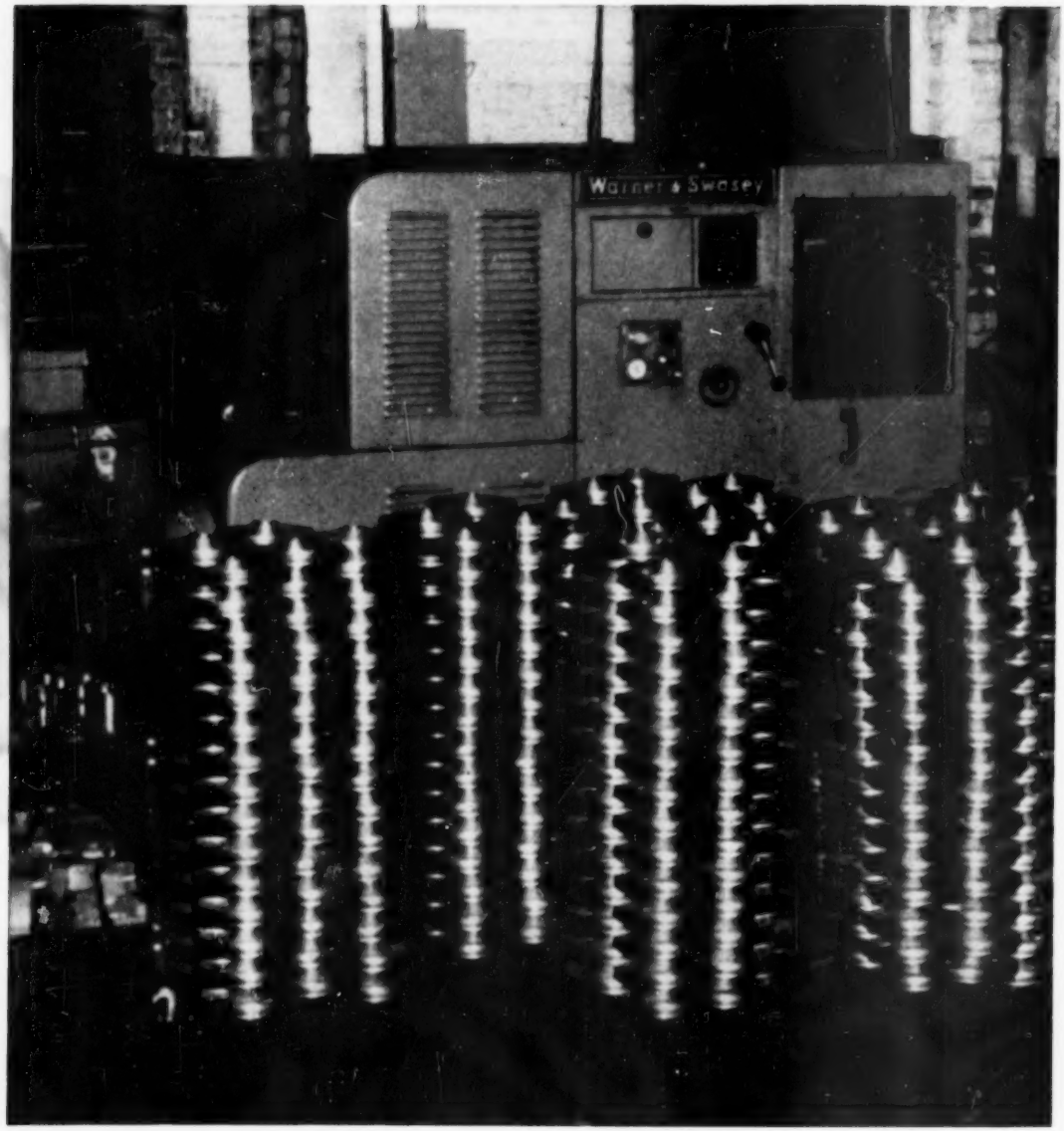
CK's positive, metered pressure and automatic lubrication assured cool, wear-free operation in spite of heavy cutting load.



New No. 4 Model CK 25hp Plain

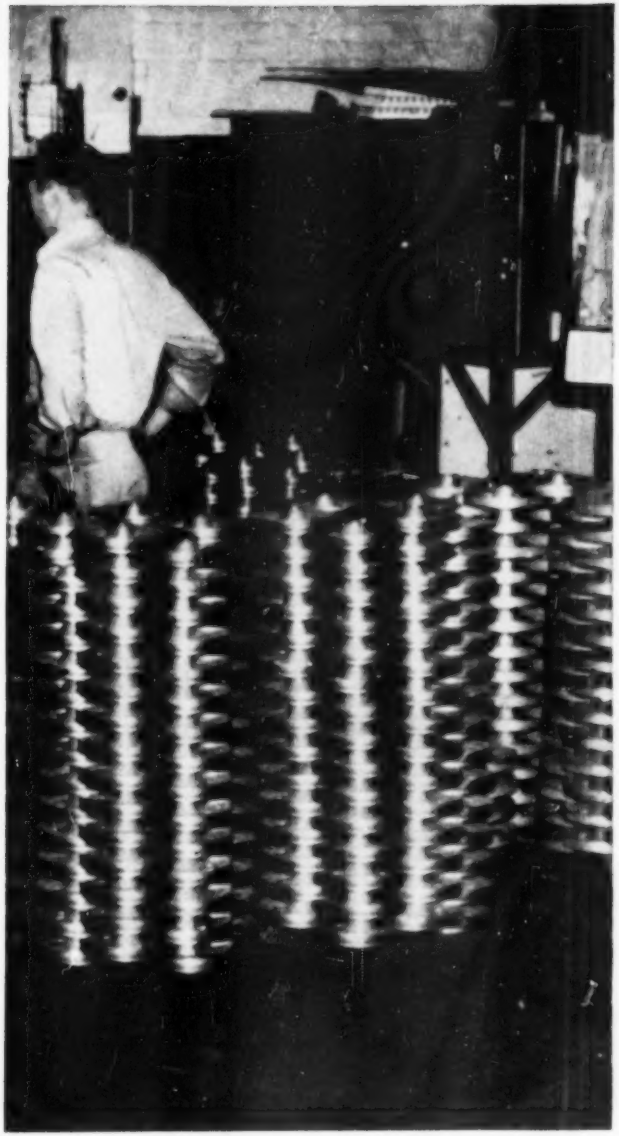
Investigate the new CK line of milling machines. You'll find every feature is test and job-proven to give you cost-cutting results . . . greater machine capacity, productivity and better finished products. Contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

8000 reasons why Goldens'



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER

like the Warner & Swasey 1-AC



● The pulleys shown in the picture, part of an 8000-lot run, might not have been possible at Goldens' Foundry & Machine Company of Columbus, Georgia, if it had not been for their new Warner & Swasey 1-AC Single Spindle Automatic.

Bought originally to produce parts in quantities of 100 to 700, the 1-AC did that job well . . . far surpassed production over previous hand-operated methods, and with accuracy of six ten-thousandths of an inch in the bore.

It was then that a bid on an 8000-piece pulley job was being let. This was a high priority job requiring quick delivery. Goldens' was low-bidder and, with the 1-AC, were able to meet the delivery date—both of which would have been impossible with their previous hand-operated equipment.

The 1-AC is opening up profitable new fields for this company—paying itself off fast.

Project the possibilities of the 1-AC into your own plant, your own market. Your Warner & Swasey Representative will be glad to help.

WARNER & SWASEY
Cleveland

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

"Yessir . . . every cutting tool in

. . . is handled by our MORSE-

He Knows How to Cut Costs for Us with MORSE ELECTROLIZED TOOLS"

Here's the quickest way to cut production costs: Order the best cutting tools you can buy . . . Morse High Speed Tools, correctly specified for the job in hand. Then specify "MORSE ELECTROLIZED" . . . and you'll get many times more the wear-life than you ever got from *any* tools on that job before . . . as scores of leading metal-working plants have done, in the last 3 years.

Get in touch today with your Morse-Franchised Distributor . . . your *only* source of supply for Morse Electrolized Tools. He has the stock and the know-how to help you start cashing in *right now*, on real savings in production costs.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

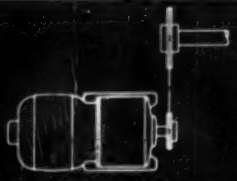
MORSE
Cutting Tools

. . . buy them by phone from your Morse-Franchised Distributor and save ordering time

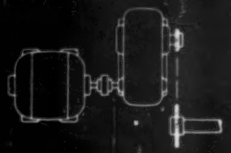
FRANCHISED DISTRIBUTOR
MORSE
FRANCHISED
DISTRIBUTOR
MFD
MORSE

Is your speed reduction problem in this picture?

High-ratio reduction and right-angle takeoff

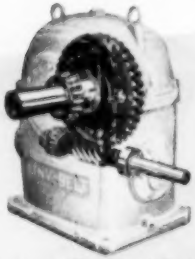


Restricted Space for mounting



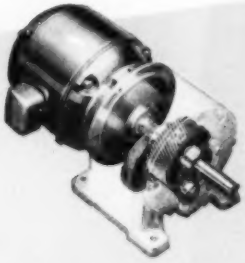
High hp with parallel takeoff

If it is, LINK-BELT has the right reducer for your requirements



Worm Gear Drive

Reduction ratios: 5.1:1 to 8000:1. Torque: 1400 to 123,000 in. lbs. Output shaft rpm: 0.22 to 564. Drawing shows motorized P.I.V. variable speed and worm gear drives direct-coupled.



Gearmotor

Reduction ratios: 6.2:1 to 292:1. Hp range: 1 to 50. Output shaft rpm: 6 to 280. Drawing at top of page shows gearmotor with roller chain drive.

Herringbone Gear Drive

Reduction ratios: 2.84:1 to 318:1. Hp range: ½ to 1000. Output shaft rpm: 2 to 600. Drawing at top of page shows motor with herringbone gear drive and roller chain drive.

Yes, LINK-BELT builds all 3

HELICAL, Herringbone or Worm gear drive — Link-Belt builds them all. And all are made in the widest range of hp ratings and reduction ratios. Truly a specific drive for every reduction problem.

All of this enables the Link-Belt power transmission engineer to recommend the *one* drive best suited to your requirements. And you can be equally sure that every Link-Belt drive is precision engineered for quiet, economical, long-life service.

Call the Link-Belt office near you for engineering information on any or all of these enclosed gear drives. Send for catalogs.

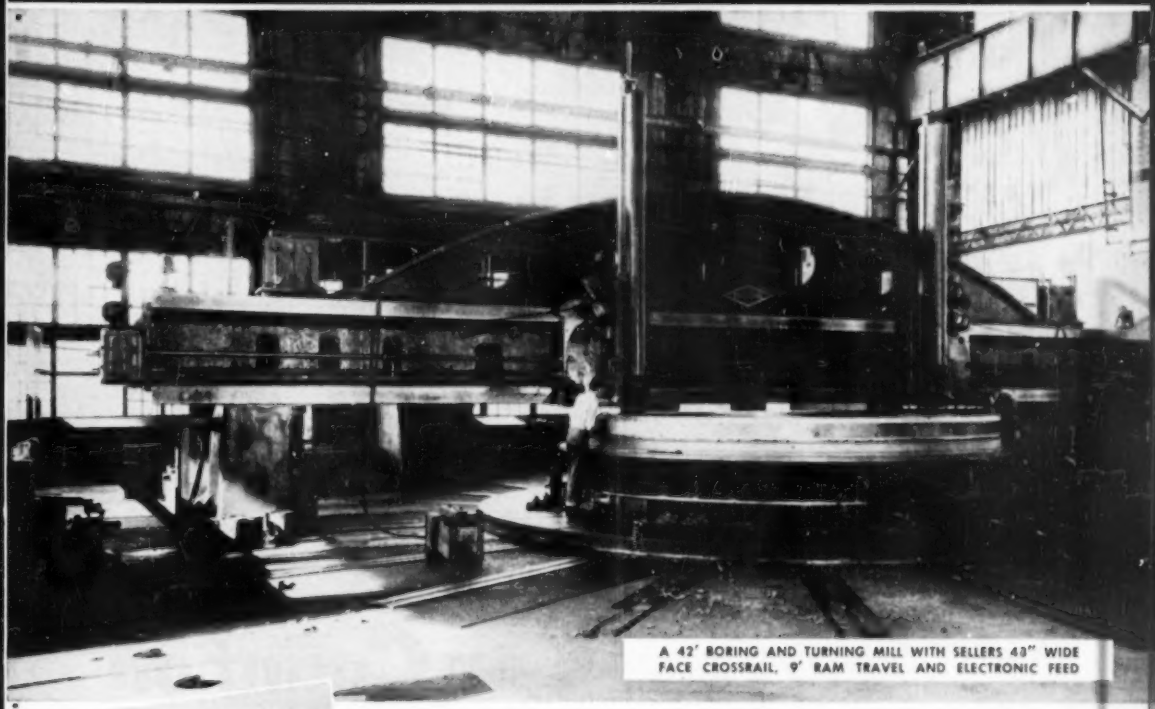
LINK-BELT

ENCLOSED GEAR DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities. 12.00

For your big jobs . . .

CONSOLIDATED HEAVY DUTY BORING AND TURNING MILLS



A 42' BORING AND TURNING MILL WITH SELLERS 48" WIDE FACE CROSSRAIL, 9' RAM TRAVEL AND ELECTRONIC FEED

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

With the Sellers Electronic Feed* to the crossrail heads, the feed can be varied in fine increments while the tool is cutting. This is of primary importance when using carbide tools as it insures getting maximum efficiency from both tools and machine. The unusual practicability of this advanced type of control is such that all feed and speed changes are controlled by portable push buttons always convenient at the point where the operator is working.

Consolidated Heavy Duty Vertical Boring and Turning Mills are of rugged uncomplicated design particularly adapted to heavy continuous operations requiring a high degree of accuracy combined with power. Among outstanding features that make them leaders in their field, is their type of table mounting which insures positive concentricity. Built in a range of sizes from 100" up to any requirement. Full information covering any size will be furnished upon request.

*Patents Pending

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

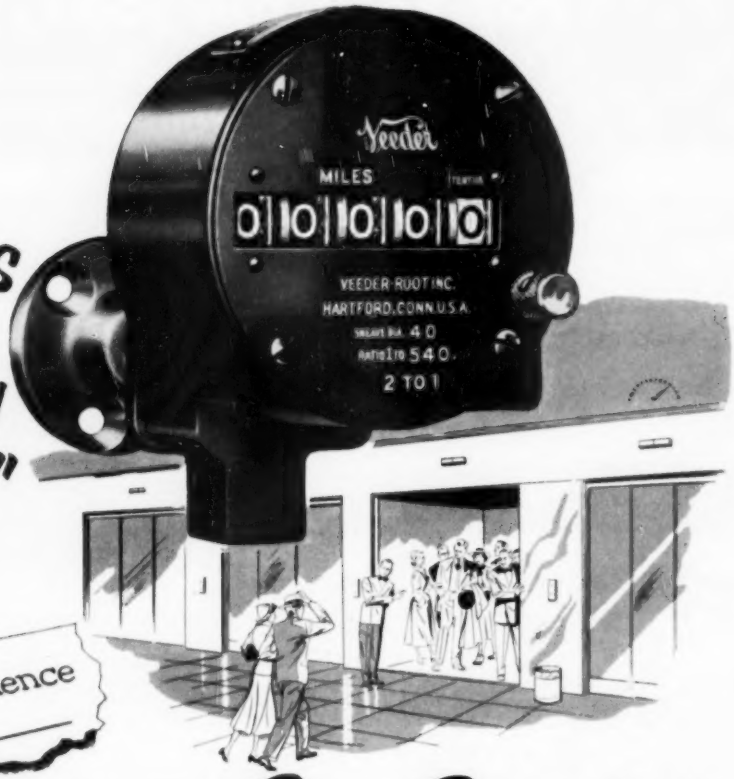
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK



It counts your "UPS and DOWNS"

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

Elevator Mileage Recorders give accurate figures on vertical miles . . . so that it can be plainly seen...*in advance*...when it's time to replace cables, overhaul cars, motors, and what have *you . . . including your life.*

Yes, the V-R wheelmark monogram protects millions of people daily, from the depths of the sea to the stratosphere. Of course, not all V-R Products and services are available nowadays . . . but if your work counts importantly in defense, then you can count on Veeder-Root to help you, as soon as rush commitments permit.

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN.

Chicago 6, Ill. • New York 19 • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland

Offices and agents in principal cities

"Counts Everything on Earth"

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of

"AMERICAN" PACEMAKER LATHES

They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to gauge tolerances for interchangeability. Should replacement ever be required,

After hardening, the metallographical structure is stabilized by cold treatment at minus 100° Fahrenheit to prevent twisting or warping.

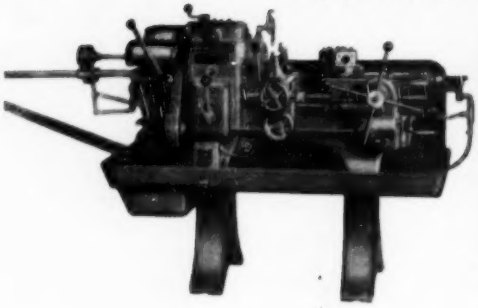
This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

Bulletin No. 19 gives the complete story—want one?

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

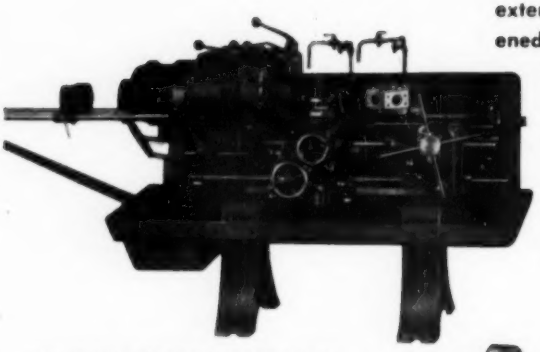
LATHES AND RADIAL DRILLS

No. 2 GEARED ELECTRIC TURRET LATHE
Bar capacities, standard work 1" x 7", Swing 13½"

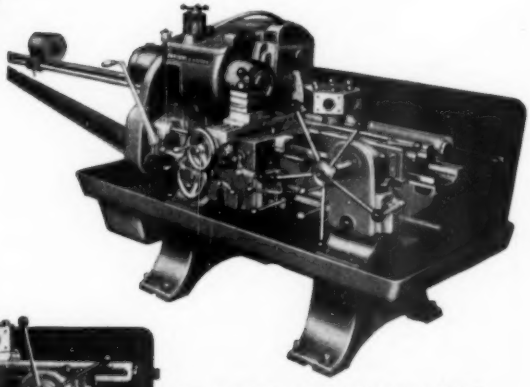


An Outstanding Line of RAM TYPE TURRET LATHES

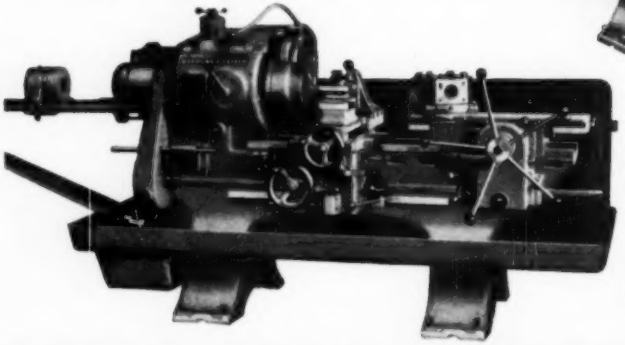
This comprehensive line of Ram Type Turret Lathes features outstanding ease of operation. The most extensive use of anti-friction bearings and hardened-ground alloy steel wearing surfaces combined with highest safety factor in power transmission and utmost rigidity of all tool supporting members lends long lived accuracy and great productive capacity. The exclusively Bardons & Oliver combination of pre-eminent features makes each size a leader in its own field.



No. 3 UNIVERSAL TURRET LATHE
Bar capacities, standard work 1½" x 9", light work 2" x 9". Swing 15½"



No. 7 UNIVERSAL TURRET LATHE
Bar capacities, heavy duty work 2½" x 14", standard duty work 3" x 14". Swing 21½"



No. 5 UNIVERSAL TURRET LATHE
Bar capacities, heavy duty work 2" x 12", standard duty work 2½" x 12". Swing 18"

•

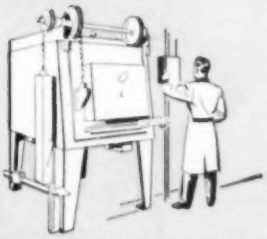
WE ALSO BUILD A COMPLETE LINE OF CUTOFF MACHINES

•

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

for toolroom or high production... quality HEAT-TREATING calls for a WESTINGHOUSE FURNACE...



Typical Westinghouse Box Furnace used in toolroom heat-treating for hardening. Other Westinghouse Furnaces available for carburizing, drawing, ageing, annealing, austempering, brazing, carbonitriding, martempering, nitriding, preheating, sintering, solution treatment.

There's a Westinghouse furnace to provide the exact answer for every heat-treating application . . . gas or electric. For toolroom or for low-to-medium production applications, choose from over fifteen standard types of box furnaces, ten protective atmospheres. J-10373

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ARMSTRONG

Modern Tooling Calls for *the Correct*

ARMSTRONG TOOL HOLDERS for each operation

In the old days it was a matter of pride with toolmakers to be able to do the work at hand with the tools at hand. It's a credit to their skill that they could devise to cut threads, do cutting-off and facing, as well as many other operations with one ARMSTRONG TURNING TOOL, but, at today's labor cost, this would be an expensive practice. The maximum of productive work and true machining efficiency can only be obtained by providing the correct ARMSTRONG TOOL HOLDERS for each operation.

The Armstrong System of Tool Holders provides specially designed ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers . . . Turning Tools, Boring Tools, Threading Tools, Knurling Tools, Cutting-Off Tools; tool holders with straight shanks, with off-set shanks, rigid tools and "spring" tools . . . special tool holders for high speed steel bits or blades, for ARMIDE (carbide-tipped) Cutters, for ARMALOY (cast alloy) Bits and Blades.

These modern efficient ARMSTRONG TOOL HOLDERS are as available as your telephone for they are carried in stock by your local ARMSTRONG Distributor.

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"THE TOOL HOLDER PEOPLE"

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Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

HOW TO DO FAST, ACCURATE MACHINING OF MOTOR FRAMES

No. 12 Hydraulic Handles Variety of Sizes

Here is an excellent setup for machining electric motor frames in a variety of sizes ranging from 630 to 204 frames. The job is done on a No. 12 Hydraulic Automatic Lathe with both ends of the frame machined at once.

Simultaneous machining of the two rabbet fits assures a minimum and uniform air gap. It also means the end bells are concentric, parallel and in perfect alignment.

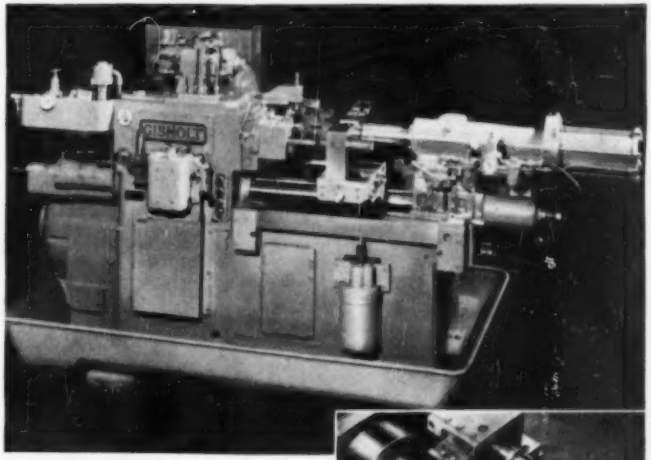
One Automatic Operation

The frames come to the No. 12 Hydraulic with motor windings in place. The parts are quickly located and held by an air-operated mandrel. Tools on all four slides complete the rabbet fit and facing of both ends in one automatic operation. Floor-to-floor time on all motor frames is low, with the 204 frame (8⅝" stator) handled in only .7 minute with carbide tooling.

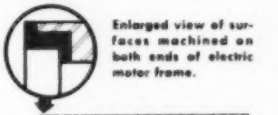
The job is planned for rapid changeover with tool slides having individual tool adjustments for handling the full range of frame sizes.

Fast, steady output of a variety of motor frames is provided by the No. 12 Hydraulic—with further savings coming from its extreme simplicity of setup, operation and maintenance.

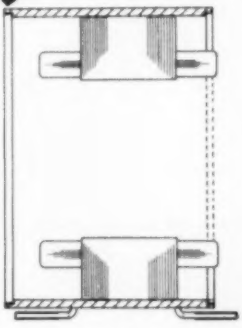
You'll get a good look at the No. 12 Hydraulic Automatic Lathe—its versatility and speed—when you have this complete new catalog. In it are full information and specifications plus photos and facts on 28 different jobs! Write for it today.

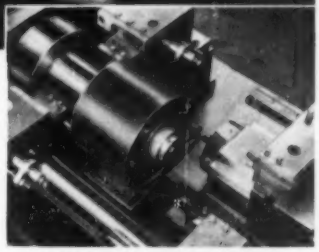


The No. 12 Hydraulic for machining electric motor frames.

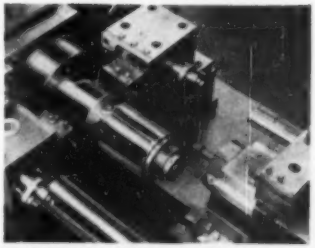


Enlarged view of surfaces machined on both ends of electric motor frame.





No. 12 Hydraulic with part chucked.



Tool setup of No. 12 Hydraulic with air-operated mandrel.

GISHOLT

TIME-SAVING IDEAS

CONTOUR BORING WITH C/F TURRET LATHE

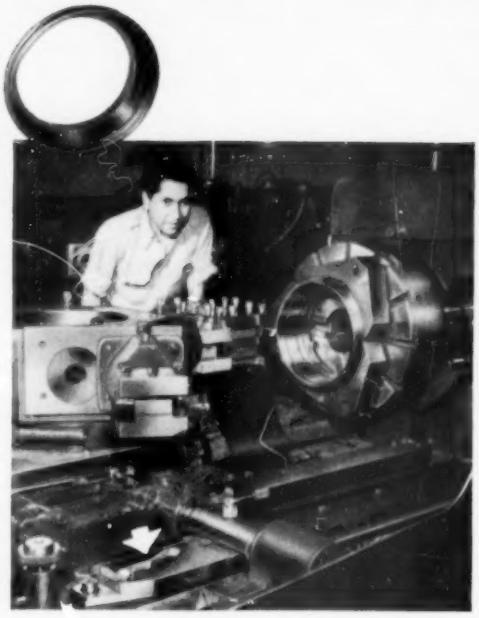
Work Done with Special Cam Plate in Standard Taper Attachment

This 5L Saddle Type Turret Lathe is busy at top priority work in our nation's big jet engine program. The part is a turbine nozzle support, still high on the restricted list.

However, it's no secret how the cross-feeding turret and taper attachment of this turret lathe solved the problem of boring a special I.D. contour. Instead of a conventional guide plate, a special cam plate is inserted in the standard taper attachment. A cam follower on the cross feeding hexagon turret follows this guide while the stub boring bar completes the contour boring. After completing the cut, the follower can be instantly disengaged from the hexagon turret for straight turning and boring work.

There's a four-page picture story that shows how unusual turret lathe tooling and setups are producing vital turbojet engine parts. Ask for *"Turret Lathes Build Turbojets."*

Turbine nozzle support is machined from raw forging.

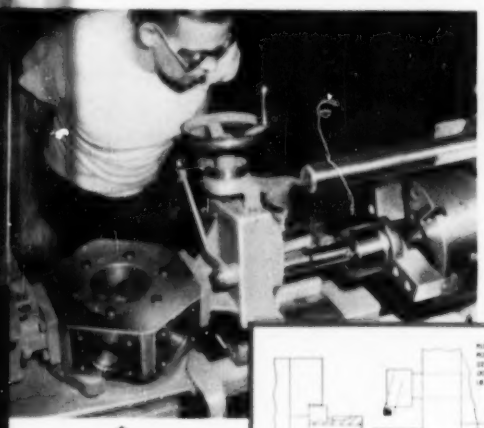


Setup for machining I.D. contour of jet engine turbine nozzle support. Note special cam plate in taper attachment.

Single special cam plate adapts standard turret lathe for contour boring work.

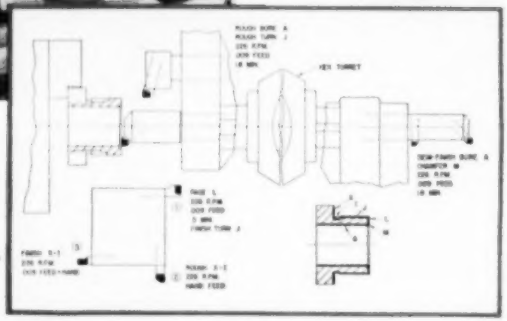
HE'S DOING IT THE RIGHT WAY

Both Turrets Working at Same Time



This close-up shows how both turrets are working at same time in machining bushing.

Steel forging and finished bushing after removal of one-third of original metal.



Tool setup for machining bushing.

There's a reminder in this photo for all of us . . . and that is to watch every turret lathe job for the opportunity to do simultaneous machining from *both* turrets.

The part here is a bushing. It's machined on a No. 5 Ram Type Turret Lathe from a steel forging by well-planned but simple tooling. Rough turning, rough and finish boring and chamfering are all handled from just two faces of the hexagon turret. While this is taking place, tools on the quick-indexing square turret do finish turning, rough and finish facing and forming.

Thus, through the simultaneous use of both turrets, six surfaces are machined on this 5⅛" steel forging in only 5.4 minutes floor to floor. If only one turret were working at a time, the job would take far longer.

Simple multiple tooling on the hexagon turret, plus simultaneous machining from both turrets, means real efficiency on this job.

GISHOLT

TIME-SAVING IDEAS

HOW TO MAKE BIG SAVING ON MEDIUM RUNS

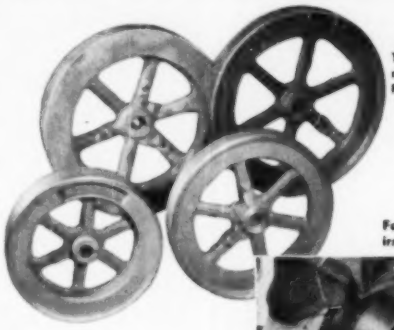
FAIRBANKS-MORSE Knows the Way—with the Fastermatic Automatic Turret Lathe

Here's another case that proves you don't need big runs to take advantage of the economies of the Fastermatic Automatic Turret Lathe. This time it's at work for Fairbanks, Morse & Co., producing a variety of flywheels in lots of 100 for their famous one-cylinder gasoline engines. The job is set up this way:

Station 1—Core drill, rough the O.D. and rough face the hub while rear cross slide straddle faces the rim. 2—Rough the bore and finish the O.D. while front cross slide finish straddle faces the rim and 1/16" radius. 3—Face the hub with turret facing attachment. 4—Finish the bore. 5—Face spokes for pulley fit with turret facing attachment. 6—Ream the bore.

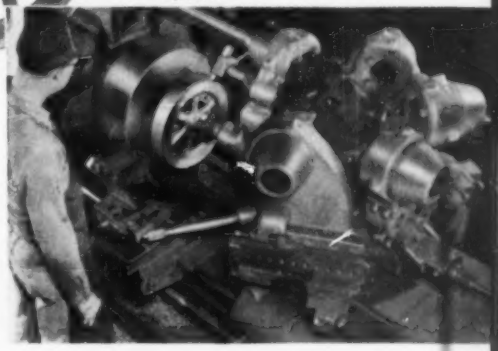
With this medium run job now handled on the Fastermatic Automatic Turret Lathe, there are no longer the delays in assembly which minor errors of hand operation caused. Man power is more productive because one operator can run two or more machines.

The faster production and greater accuracy of the Fastermatic, with one man operating two machines, make possible big savings on medium runs.



Typical flywheels machined on the one Fastermatic.

Fastermatic set up for machining cast-iron flywheels.



NINE DEEP GROOVE CUTS IN ONE OPERATION

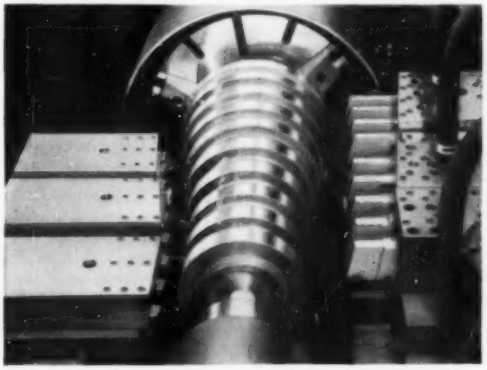
Simplimatic Automatic Lathe Simplifies the Job

The part you see here is an all-important compressor rotor for a well-known jet engine. Accuracy and high production are good reasons for giving the job to the Simplimatic Automatic Lathe.

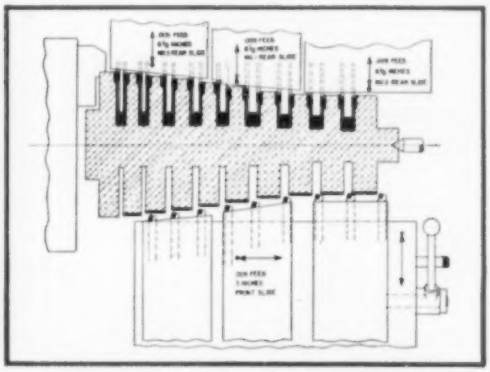
The nine grooves between the stages must be widened carefully. To do this, twenty-seven grooving tools are mounted in three rear slides. These have a common drive and are arranged so that only one slide is cleaning up at a time. This avoids excessive tool pressure.

Tools on the single front slide turn nine diameters with automatic approach, feed and return. Tools are fed laterally to machine all stage diameters except the large holding diameter. The front slide is then manually retracted to provide unloading clearance. Floor-to-floor time is an even nine minutes.

With 36 tools on front and rear slides, this Simplimatic accurately machines these difficult parts in one chucking.



Tooling on front and rear slides for machining compressor rotor.



Tool arrangement of Simplimatic for compressor rotor job.

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GISHOLT

TIME-SAVING IDEAS

NEWEST IN CRANKSHAFT BALANCING

Amazing Machine is Ultimate in Automatic Operation

Wonders never seem to cease in this important field of balancing—as proved by this special DYNETRIC Balancing Machine now on the job for a large automobile manufacturer. The machine handles V-8 crankshafts. Here's the way it operates:

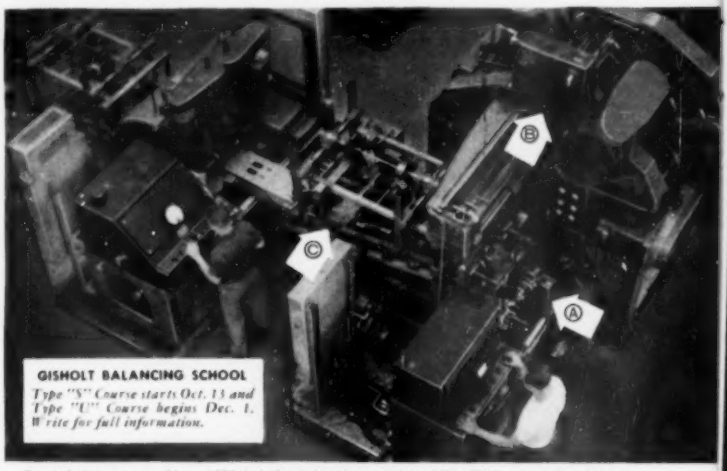
1 Crankshaft is inserted in machine, and operator measures and locates unbalance. This data is electrically transmitted to 1st correction driller.

2 Crankshaft is conveyed into driller where correction is automatically made on basis of data received from Balancing Machine. Meanwhile, unbalance in next crankshaft is being measured and located.

3 With 1st drilling completed, crankshaft is automatically carried to 2nd balancing stage. This "unloader" serves as a storehouse, holding up to 7 crankshafts as a reserve in case of line stoppage.

4 Second operator measures and locates any unbalance remaining after 1st correction and makes final corrections with small driller.

5 Crankshaft moves to 2nd "unloader" and on to assembly line for Superfinishing.

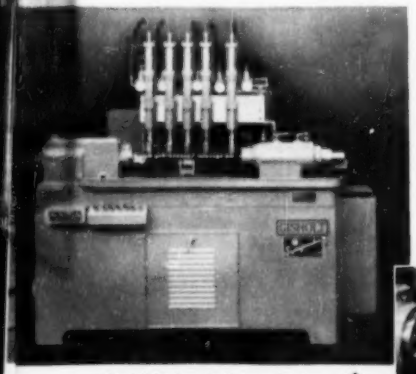


Crankshaft enters machine at (A), is balanced and moves into driller (B) for correction. It then travels "unloader" (C) to 2nd machine for final balancing.

Production is 40 balanced and inspected crankshafts per hour.

While this is a special machine for automotive work, Gisholt balancing equipment is adaptable for virtually all balancing problems—high production or not. Write for 6-page reprint, *"Continuous Crankshaft Balancing,"* giving the full story on this crankshaft job.

DYNETRIC BALANCERS GISHOLT



Model 80 Camshaft Superfinisher.

CAMSHAFT BEARING SURFACES GIVEN LONGER LIFE BY SUPERFINISHING

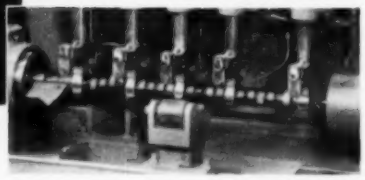
Five Surfaces Superfinished at Once at Little Cost

Here, a Model 80 Superfinisher is in the process of making life easier and longer for camshafts—through finer, smoother, longer wearing bearing surfaces.

The camshaft is loaded into the collet and supported with an air-operated tailstock. While the camshaft is rotating, the Superfinishing stones oscillate to scrub away the amorphous metal left by grinding. In 0.5 minute floor-to-floor time, this operation is complete.

These camshaft main bearings have a surface finish of 30-40 micro-inches before Superfinishing and 4-6 micro-inches after. The machine is quickly adjusted for other sizes.

The entire subject of Superfinishing is interestingly told in the book, *"Wear and Surface Finish."* Send for your free copy.



Close-up showing Superfinishing of 5 surfaces at once.

Better camshaft performance is assured with smear metal, grinder flats removed from bearing surfaces by Superfinishing.

No. 7-852
597

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

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HOW TO DEODORIZE A JOB . . .

Every operator in your shop will realize he has a better job when you take the odor out of it. And all you have to do is specify Cimcool.°

Cimcool is the revolutionary cutting fluid that virtually eliminates rancidity even in the hottest weather. It's a *chemical emulsion*. Can't burn. Can't smoke. Has no objectionable odor of its own.

And those aren't the only reasons why operators like their jobs better when Cimcool is on the job. Cimcool is clean to work with, doesn't soil hands or clothes. Leaves no hazardous slippery film on hands, machine, work or floor. Contains no skin irritants. And Cimcool cools so fast that tools and chips actually stay cool to the touch. You'll get better production when you make jobs better with Cimcool!

Write for free booklet, "CIMCOOL Defeats Heat". Address, Sales Manager Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U. S. Pat. Off.

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THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

NIAGARA

SERIES B
GAP FRAME Double Crank Presses

Niagara B-4 x 72 Press at the General Machine Works in Los Angeles. It is shown here fitted with two dies for forming operations on an automatic deflector.

The same press as shown above arranged with dies for redrawing projectile parts in 5 steps. Shells are transferred manually from die to die.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

* *Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.*

Versatility and High Production

- Gap frame convenience with double crank width.
- Ideal for long progressive dies or multi-station dies.
- Rear of press open for full accessibility.
- One piece welded steel frame for maximum rigidity and long die life.
- Exclusive Niagara Sleeve Clutches for maximum productive strokes per minute and minimum maintenance cost.
- Niagara cushions for drawing operations.
- Automatic feeds for high production jobs.

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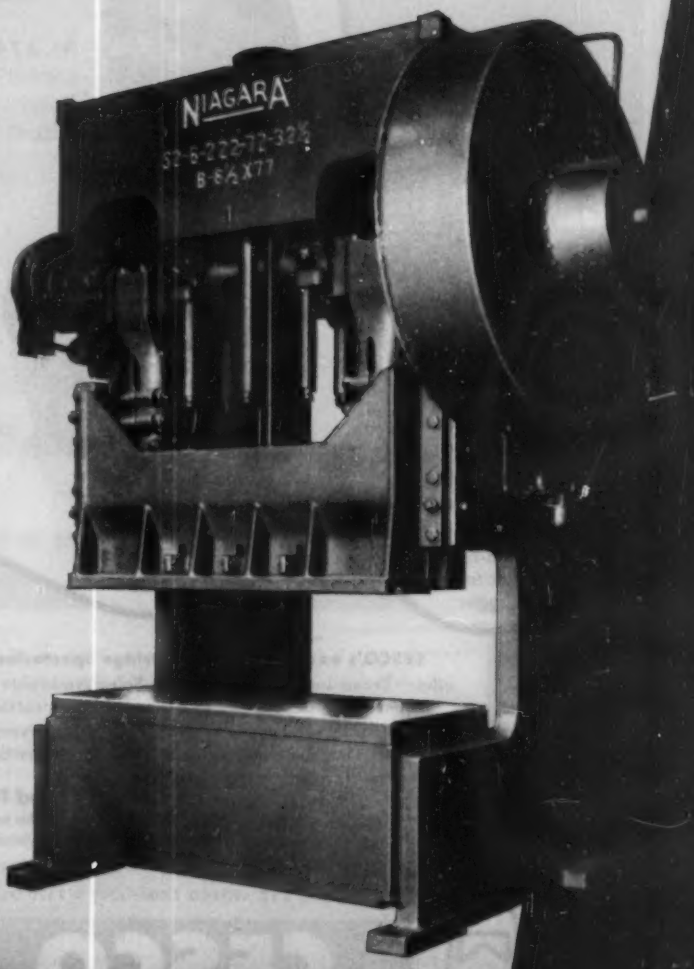

Niagara B-6½ x 77 Gap Frame Double Crank Press. Air actuated, electrically controlled sleeve clutch with friction clutch convenience and sleeve clutch economy. Air releasing brake. Clutch and gearing operating in a bath of oil. Air counterbalance for slide with surge tank over-size cylinder and pressure regulating valve to compensate for various weights of dies. Cross bar knockout in slide. V-belt motor drive.

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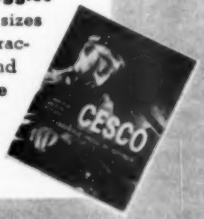
No. **374** Comfort-Bridge Goggles

No. **380** Sideshield Comfort-Bridge Goggles

No. **371** Sturdy, non-flammable plastic frame Goggles

CESCO's exclusive Comfort-Bridge

CESCO's exclusive Comfort-Bridge Spectacles and Goggles offer—Broad-bearing nose rests... Selective bridge and eye sizes ...Balanced weight distribution... Sturdy construction... Attractive appearance. There is a size and type for every face and every job. They are comfortable to wear. They provide real eye protection. They're *right before your eyes.*



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Golden Gate Bridge, San Francisco, California — San Francisco Chamber of Commerce Photo

The Invisible Background of Industrial Progress

Modern bridges over rivers, bays and harbors speed up the efficient pace of railroad, truck and pleasure travel with attendant development of surrounding areas. Some of the largest bridges in the world have been built to better serve the cities of the San Francisco Bay area. The San Mateo Bridge crosses seven miles of water and rises to a height of 135 feet.

The San Francisco Oakland Bridge, 216 feet above water is twelve miles long, including the approaches. Golden Gate Bridge, 8,940 feet long has the world's longest single span, 4,200 feet between towers, 220 feet above water. . . . The daring planning and the ultimate fulfillment of such projects require the co-ordination of free men representing many diversified skills and the products from many supply industries. . . .

★ *Modern Machine Tools* have enabled the industries of free America to meet and answer more construction and production challenges than any other country in the world. For more than seventy years Bullard has pioneered in the design and development of Machine Tools, the inevitable Invisible Background of Industrial Progress.

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★ *For greater manufacturing economy*
REFER to next page

BULLARD MACHINE TOOLS
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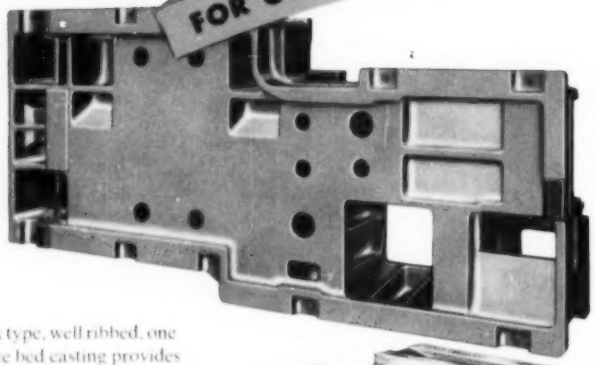

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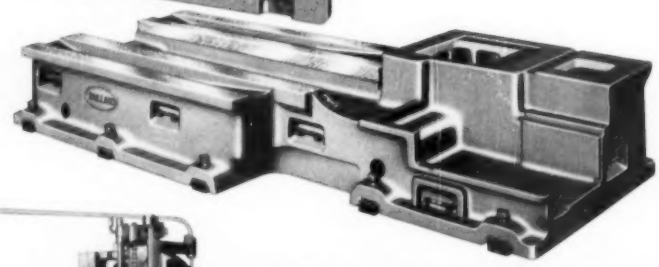
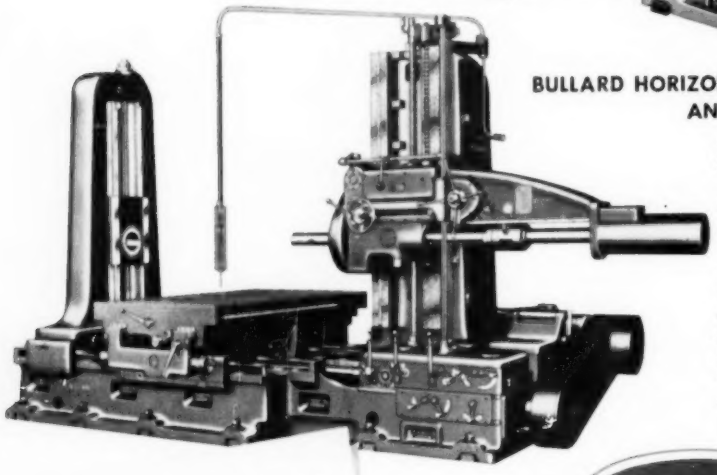
Box type, well ribbed, one piece bed casting provides extreme rigidity and uniform support. Ample bearing surfaces give maximum support for the massive saddle and table.





BULLARD HORIZONTAL BORING, MILLING AND DRILLING MACHINES

are built with 4" or 5" spindles. A choice of three — table sizes, bed lengths and post heights. A full range of 48 feeds from .0002" to 1.550" and 24 speeds 8 to 1000 R.P.M. on 4", and 7 to 850 R.P.M. on 5" machines. Hydrodynamic coupling on main drive with brake motor. Convenient right-hand control and many safety features.

Write for complete information on 4" and 5" Spindle size Bullard Horizontal Boring, Milling and Drilling Machines.

BULLARD

THE BULLARD COMPANY

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HARDINGE
ELMIRA, N.Y.

FEATURES...

Infinite Control of Speed and Feed

Tool Room and Production Lathe

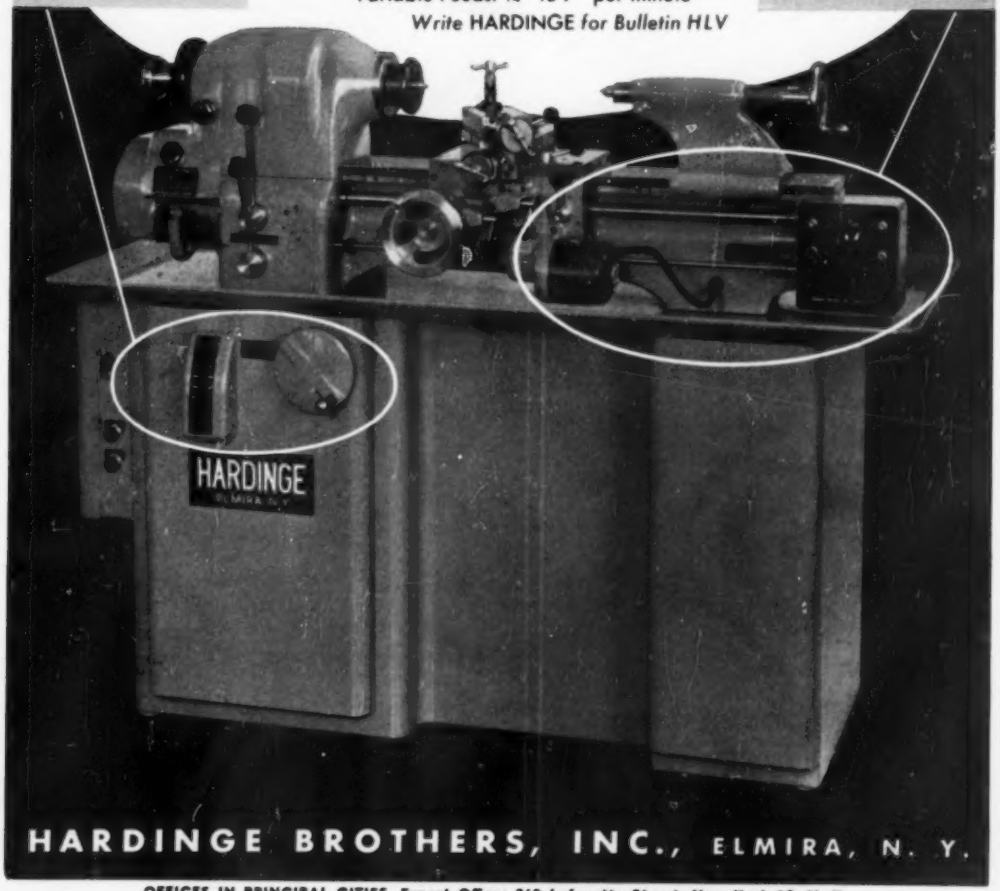
Variable Speed Drive for Headstock Spindle

Both drives are independent and infinitely variable to secure every possible combination of speeds and feeds within the following range:

Variable Speeds: 125 to 3000 r.p.m.
Variable Feeds: ¼" to 7" per minute

Write HARDINGE *for Bulletin HLV*

Variable Feed Drive for Carriage and Cross Slide



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

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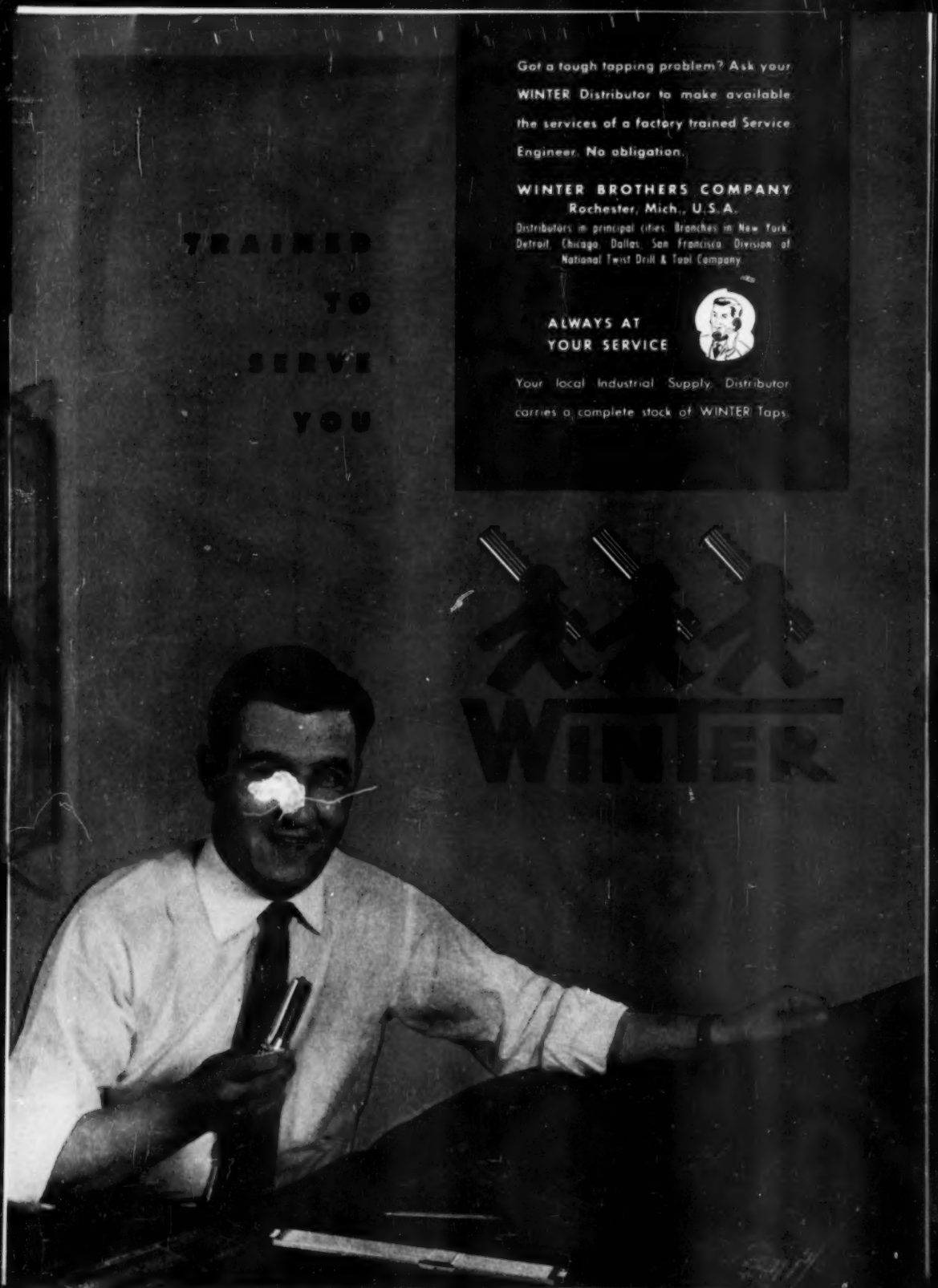
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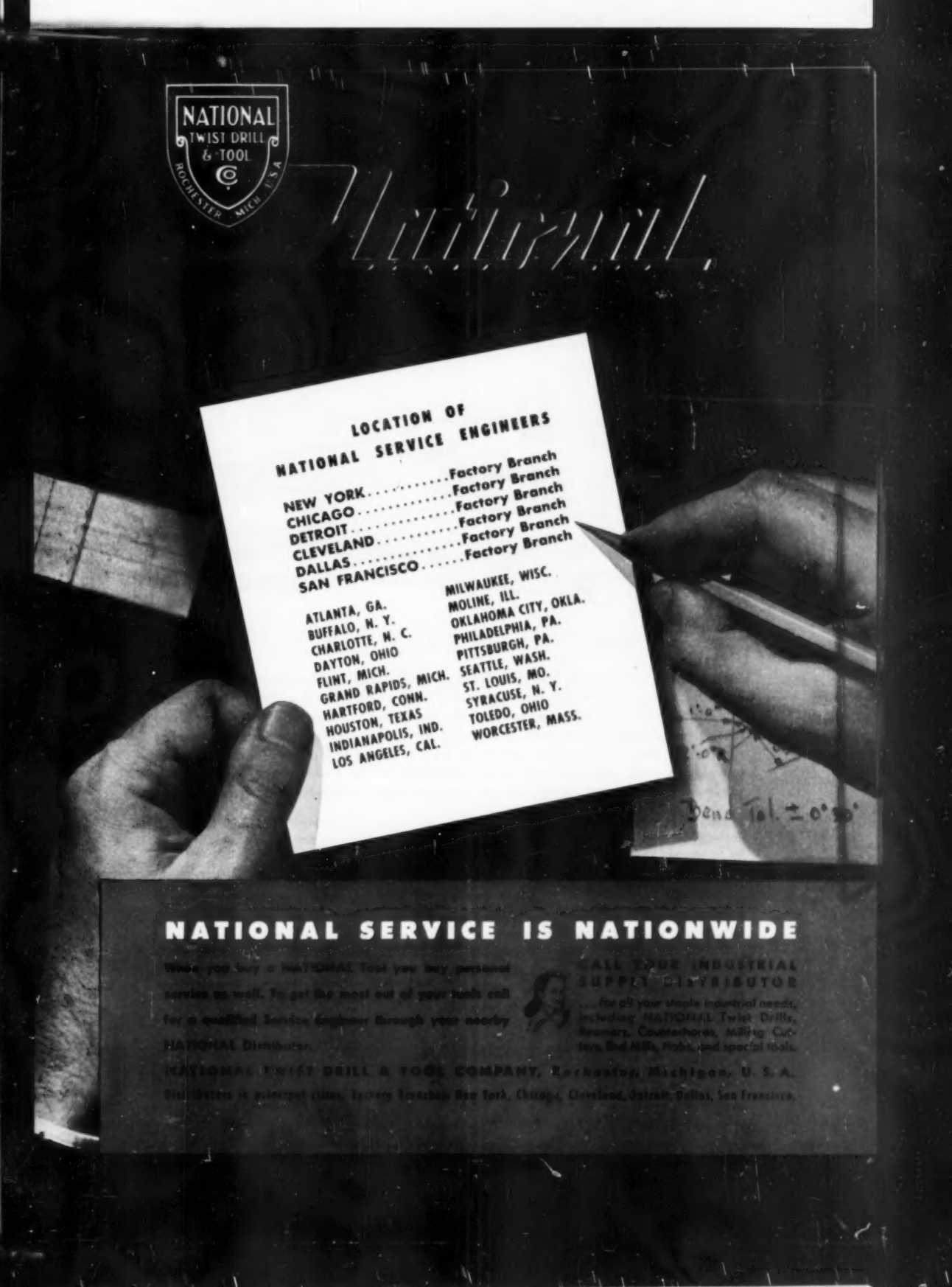
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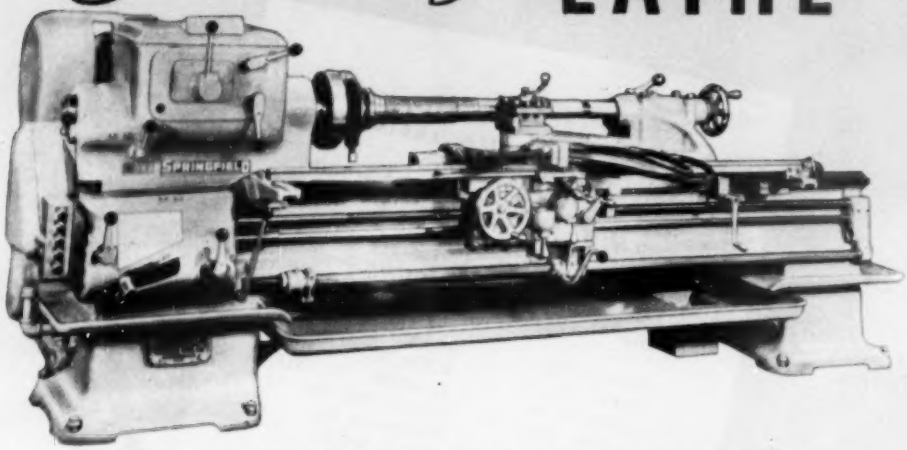
SPRINGFIELD

Contouring LATHE



***The* simplicity of the SPRINGFIELD Hydraulic Contouring Attachment is outstanding. Pilot or control circuits, remote control valves and other troublesome elements are eliminated. A motor driven hydraulic pump, relief valve and oil reservoir are the self-contained power unit furnishing hydraulic pressure to the servo-valve and full universal hydraulic compound rest. A supported and guided adjustable template holder conveniently holds templates at the front of the lathe in full view of the operator. There are no complicated mechanisms or fragile units.**

SPRINGFIELD Hydraulic Contouring lends itself perfectly to lower production costs per unit on large or small runs.

Opposed hydraulic pressures in the hydraulic cylinder hold the slide solidly for heavy duty cutting.

Full universal hydraulic compound swivels to the best angle for contouring each individual job.

Standard SPRINGFIELD Lathes with swings from 14" to 32" are used in conjunction with the hydraulic contouring attachment thus giving complete standardization of components.

Quick changeover from standard SPRINGFIELD Engine Lathe operation to contouring is made easily.

Positive, smooth, continuous, backlash-free hydraulic movement gives superior finish on turning, boring or facing.

Close coupling of stylus, servo-valve and cylinder eliminate long hydraulic lines, sluggish action and resulting inaccuracies. The SPRINGFIELD Hydraulic Contouring attachment does not reduce the normal swing capacity of the lathe.

Write for Bulletin No. 184

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

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STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. STANDARD DISTRIBUTORS IN MORE THAN 500 CITIES CAN SUPPLY YOUR REQUIREMENTS.

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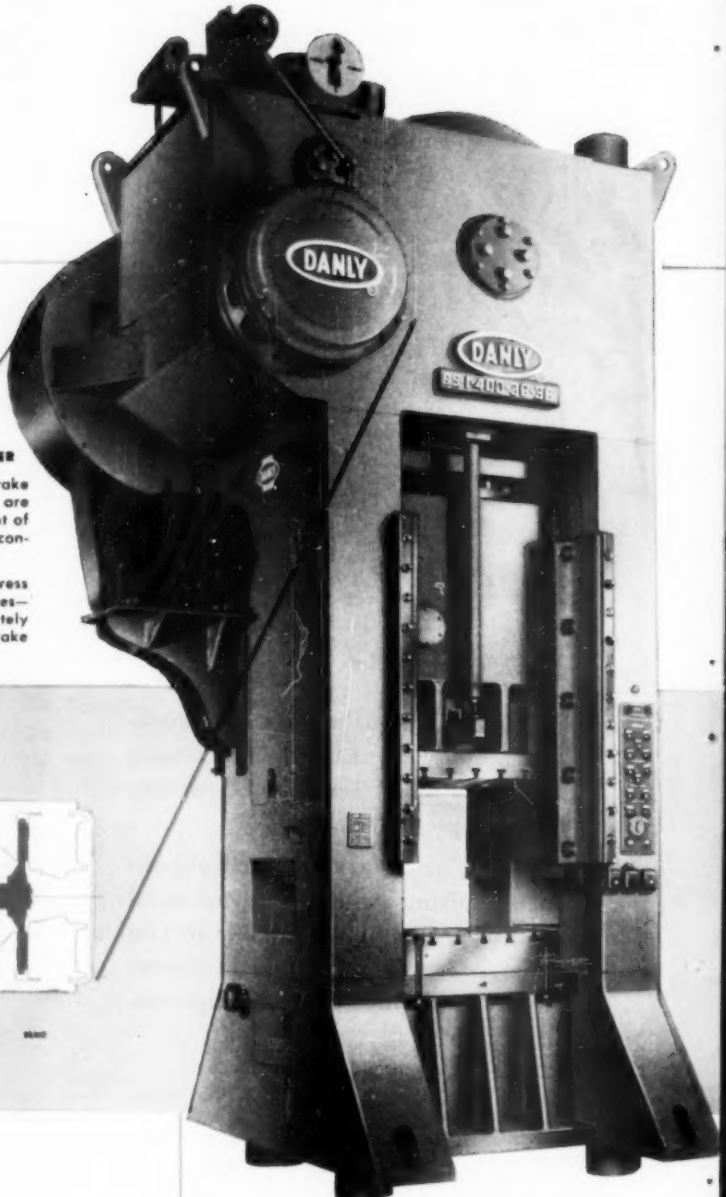
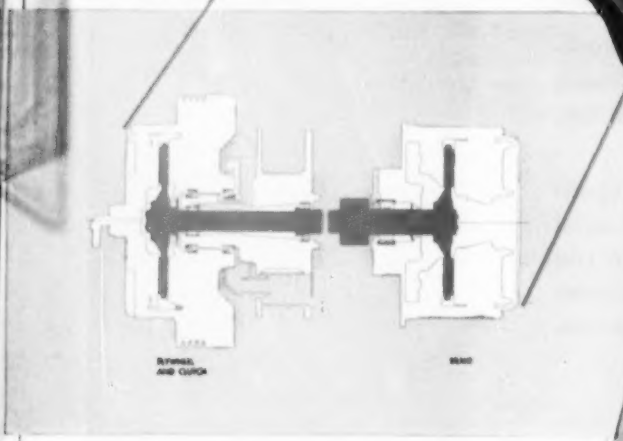


WHY THE DANLY CLUTCH AND BRAKE RUN COOLER

The rotating parts in a Danly clutch and Brake subject to "pick-up" during clutch engagement are shown in color. Danly design reduces the weight of these parts to only 1/5 as much as those in a conventional clutch of comparable torque rating.

The total energy to pick up all parts of the press subject to acceleration—including slide and dies—during clutch engagement is reduced approximately two-thirds. That's why the Danly Clutch and Brake run cooler and last longer.



A Danly 400 ton Single Action One Point Straight Side Press equipped with the Danly Cool-Running Clutch. Outboard mounting of both clutch and brake permit renewal of friction discs in less than 30 minutes.

take a close look at the drive

Actual production tests show that the new Danly Cool-Running Clutch, an exclusive Danly Press feature, withstands up to 7 times more engagements than a conventional press clutch before it is necessary to make adjustment for lining wear. The resulting reduction in maintenance and press down time for clutch take-up, an important factor in press operating costs, accounts for outstanding savings.

Features like this—together with automatic lubrication and extra rigid precision construction—are the reason why time and cost conscious production men specify . . .

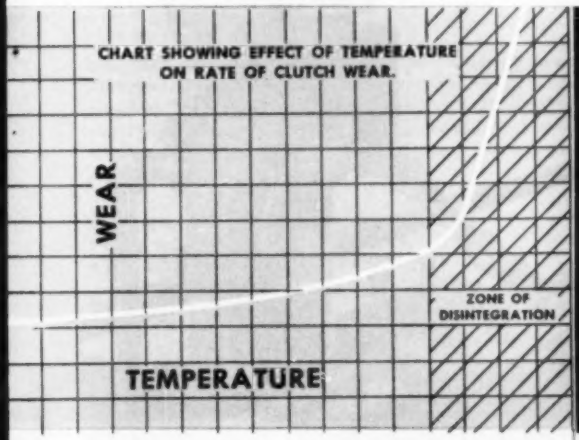
DANLY PRESSES

Danly's complete engineering staff is at your service to help you select the best presses for your job. Write today—and ask for the Danly Straight Side Press Catalog.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

It costs less to run a DANLY PRESS!

Single Action Straight Side | Autofeed | Underdrive Single, Double, Triple Action | Gap Frame | Double Action Straight Side



WHY DANLY FRICTION DISCS LAST UP TO 7 TIMES LONGER

Chart shows how heat causes disintegration of lining in a press clutch. The steep slope in the curve shows how wear rapidly increases with temperatures.

The cool running Danly clutch generates less heat and the small amount generated is rapidly carried off by a continuous blast of forced air.

Normal operation of a Danly Cool Running Clutch is only 35° above room temperature!

DANLY

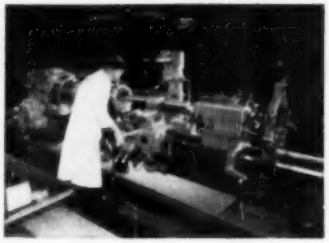
MECHANICAL PRESSES . . . 50 TO 3000 TONS

HYDRAULIC METALWORKING EQUIPMENT

33% time saved...

on complicated TANK part...with

LODGE & SHIPLEY COPYMATIC LATHE



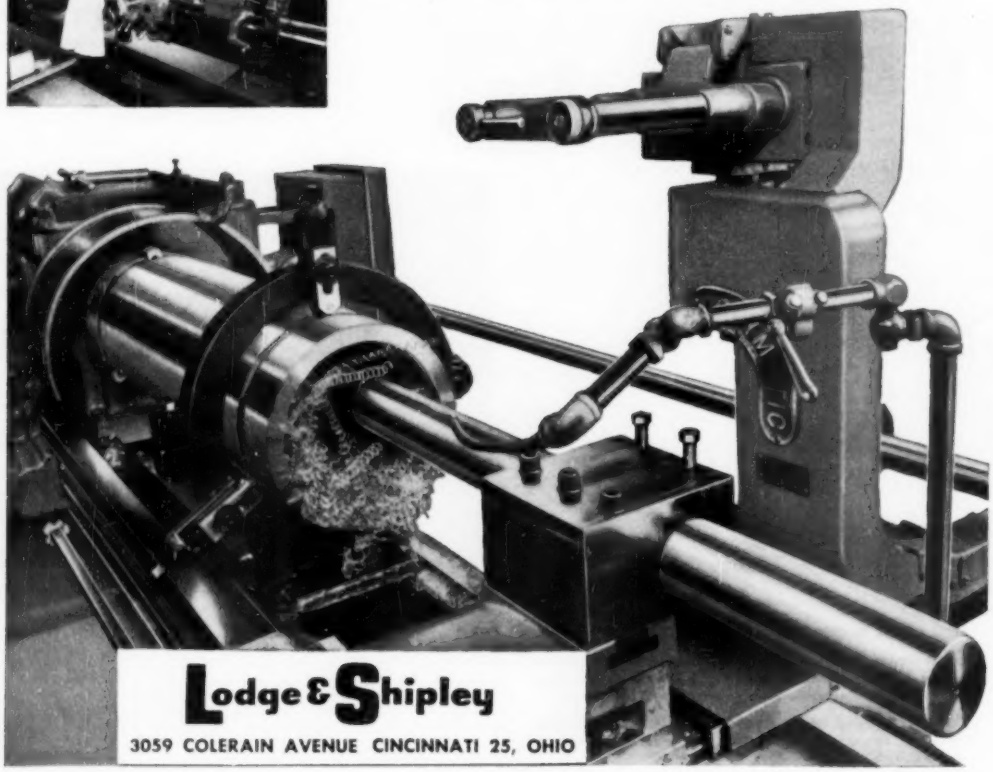
3 out of 4 lathes at MAGNA MILLS PRODUCTS Southgate, California, are LODGE & SHIPLEY

Specializing in the machining of large forgings, extrusions, die castings and tooling, this "high precision" machine shop chose Lodge & Shipley to do their lathe work.

A typical job, illustrated here, is the rough and finish contour boring of a large dural extrusion for a tank sub-contract, using a "Model X" 20" x 102" COPYMATIC. At 171 RPM, .025"/rev. feed is used for the rough operation, .008"/rev. feed for the finish. Floor-to-floor time on the complicated job is just 5 hours . . . a *33% saving in time!*

You will find, just as this user has, that the Lodge & Shipley COPYMATIC is an "accurate and good all-around production lathe." Ask for a detailed explanation of how COPYMATIC combines the speed and convenience of automatic duplication with proven Lodge & Shipley "Model X" accuracy and efficiency.

Write for Bulletin No. 675 and other case histories.



Lodge & Shipley

3059 COLERAIN AVENUE CINCINNATI 25, OHIO

FORM-DRESS GRINDING WHEELS *Accurately.....Rapidly*

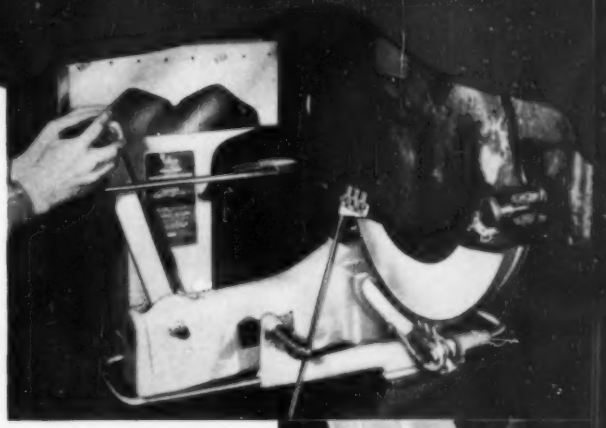
TO TENTHS OF A THOUSANDTH — IN A MATTER OF MINUTES

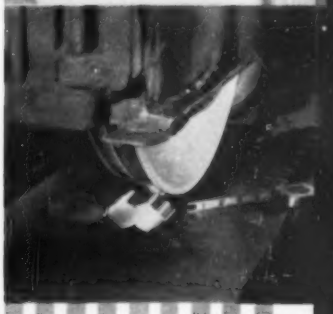
with

PRATT & WHITNEY

Diaform

WHEEL FORMING ATTACHMENT





FORM GRINDING TO NEW STANDARDS OF ACCURACY. . . is easy with DIAFORM

precision-dressing. You will be able to produce better dies, punches, and flat forming tools *in hours instead of days.*

The Pratt & Whitney DIAFORM attachment is a lightweight, portable instrument that provides a very fast, easy and accurate means of forming and re-truing grinding wheels. It can be used with horizontal spindle surface grinders, and does not interfere with normal operation when left in place on the machine.

Operation is on the pantograph principle. A tracer is lightly traversed over an inexpensive template DIAFORMING even the most complex forms in a matter of minutes. Two sizes of DIAFORM are available: 1" capacity for DIAFORMING wheels up to 10" diameter using 10 to 1 reduction ratio, and 3" capacity for wheels up to 20" diameter using 5 to 1 reduction ratio. Like all Pratt & Whitney products, the DIAFORM is manufactured and inspected to conform to rigidly high standards of quality and accuracy.

LEARN HOW DIAFORM CAN MAKE YOUR FORM GRINDING OPERATIONS BETTER AND MORE PROFITABLE

Send today for these two Bulletins. Just fill in and mail the attached coupon or write on your Company letterhead.

DO IT NOW

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Gentlemen: PLEASE MAIL MY COPY OF:

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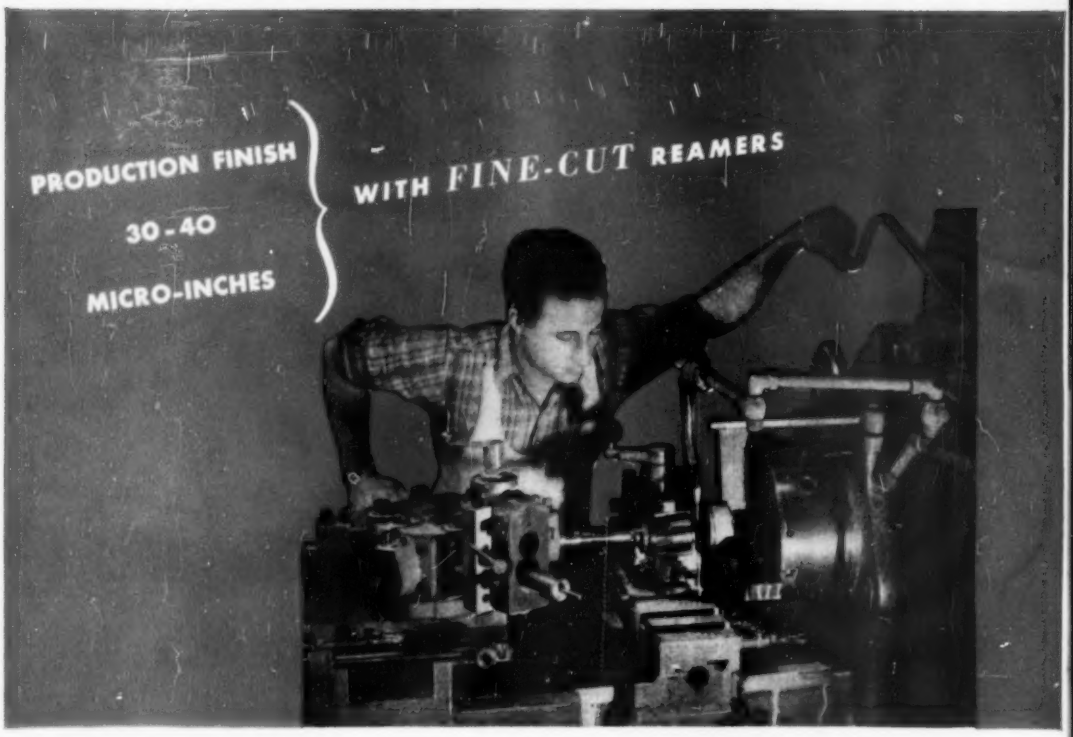
Tool Crib for Rent

CUTTING TOOLS • GAGES • MACHINE TOOLS

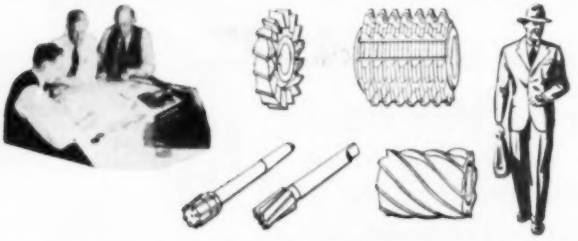


You can ream finishes like this in *regular production* operations with Barber-Colman Fine-Cut Reamers. Many jobs which previously required finishing by lapping or honing are now being finish reamed with these Fine-Cut reamers. All elements for fine finish, accuracy and tool life are provided in the reamer design and application of Barber-Colman job-engineered reamer sharpening.

With assurance of this built-in control, more pieces can be finish-reamed before breaking the set-up for re-sharpening. In addition, the Barber-Colman blade mounting design combines outstanding tool life with ease of blade adjustment and absolute rigidity. That's why you outproduce — and outearn — conventional tool designs every time with Barber-Colman reamers.

A Complete CUTTER ENGINEERING SERVICE to Solve Your Metal-Cutting Problems

BARBER COLMAN



JOB-ENGINEERED DESIGN • FULL LINE OF STANDARD TOOLS • FIELD SERVICE

Barber-Colman

FINE-CUT REAMERS

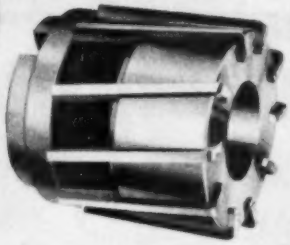
ONE-CUT FINISH REAM 30-40 MICRO-INCH FINISH, CUTTING 170 FEET PER MINUTE, USING .008" — .010" FEED

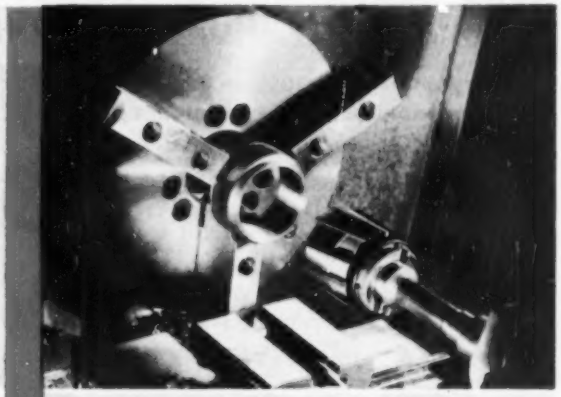
No special tooling is required to get results like these. A standard turret-lathe set-up is used. The large number of blades in the reamers provides extra stability in the cut and smaller chip load per tooth, resulting in a very fine finish.

Front chamfer, secondary lead and back taper are specified for these particular job conditions by Barber-Colman Reamer Engineers to produce free-cutting and easy chip removal without scratching, back scoring or gouging.

If you are now choosing between accurate, quality-finish reamed holes — and low-cost production and reamer maintenance — you can have both, using Barber-Colman adjustable reamers. More blades per cutting diameter — blades solidly held in cutting position — Barber-Colman standard irregular blade spacing — these features produce tool room quality under production reaming conditions.

Send specifications on hole sizing and finishing problems to Barber-Colman engineers. They will furnish reamers to give you the desired quality consistently.





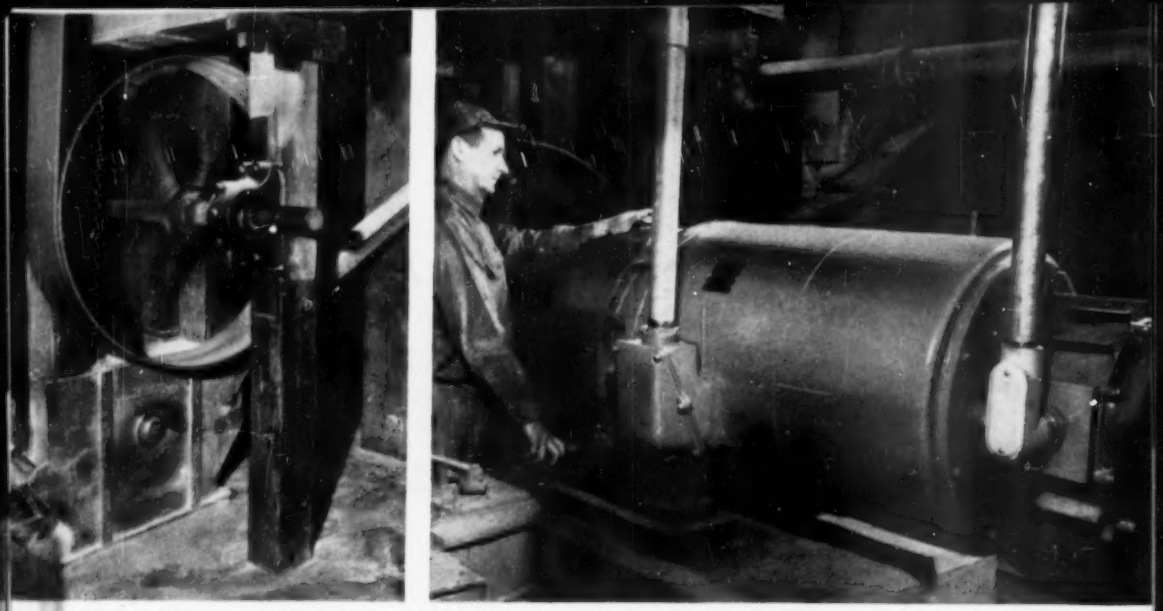
1. Reamer, held in turret lathe float, is fed to work revolving at 170 feet per minute, using .008"-.010" feed. Three thousandths stock is removed in a cut 2.88" diameter and 1-1/2" long.

2. Irregular spacing of ten reamer blades is arranged so that diameter size is easily checked across any two blades. Wedge mounting at bottom of blades permits more blades per reamer diameter — hence, finer finish.

3. Consistent 30-40 micro-inch finish is obtained on these precision boring head collars throughout the life of the reamer because of Barber-Colman job-engineered reamer sharpening.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 917 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.



F. W. Stock & Sons needed a better drive on grinding machines in flour mill. Picture at left shows old drive when shaft was powered by belts from motors and speed reducers that also drove other lines. Instead of another motor and speed reducer for new drive, they switched to a 75-hp G-E gear-motor (right) to gain additional power, modern equipment, savings on initial costs.

Three More Plants Choose G-E Gear-motors

One reports output up 20% at "A" mill; Others compactness, low maintenance

A large, independent flour mill and two prominent machinery builders have been added to the long list of industries profitably using General Electric Gear-motors.

F. W. Stock & Sons, report a production increase of 20% in their "A" mill since a 75-hp G-E Gear-motor was installed to drive flour grinding machines.

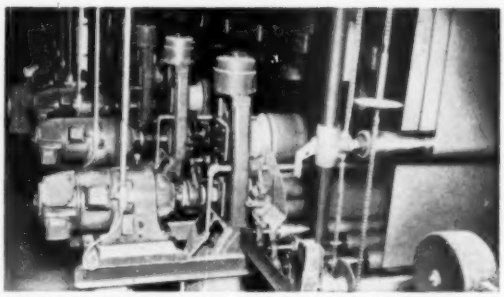
H. W. Butterworth & Sons, textile machinery manufacturer chooses G-E Gear-motors to drive machines requiring a reliable, compact low-speed drive.

F. X. Hooper Co., manufacturer of corrugated fibre box machinery, likes G-E Adjustable-speed Gear-motors because of their flexibility, trouble-free operation.

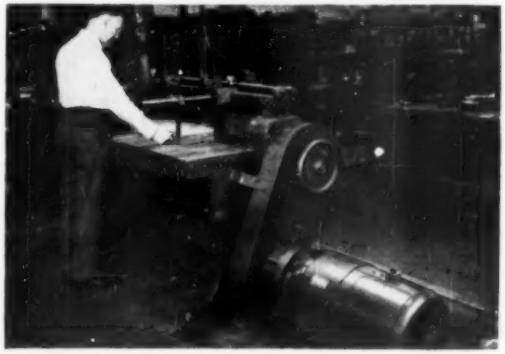
Throughout all industry, General Electric Gear-motors show "on the job" proof that they are best for most low-speed drives. And *prompt delivery* of Gear-motors is assured through warehouse stocks located in thirty-three key industrial areas. To solve your motor drive problems, contact your nearest G-E office or Distributor. *General Electric Co., Schenectady 5, N. Y.*

735-8

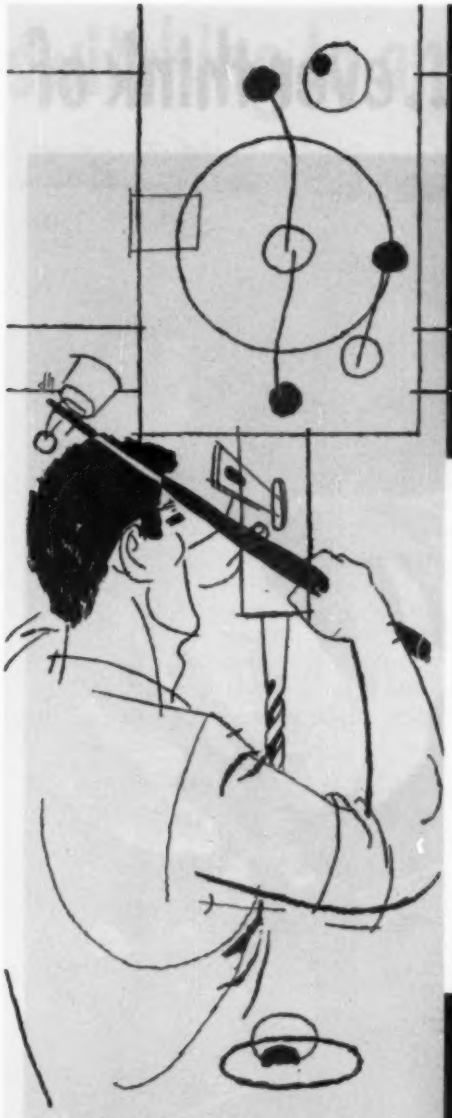
GENERAL ELECTRIC



Nine General Electric d-c gear-motors drive Butterworth soaper in Fruit of the Loom textile plant. G-E gear-motors also power agers, padders in this continuous-process finishing range.



G-E ACA adjustable-speed gear-motors now drive new F. X. Hooper partition slotters. The first installation of this modern equipment was made at a plant of the Owens-Illinois Glass Co. of California.



ARE YOU HAMMERING YOUR DRILL TOOLS INTO THE SCRAP PILE?

Tools on the scrap pile mean profits out the window. Then why let drills be pounded into scrap by the old-fashioned hammer-and-drift method of removal?

Fosdick Drills, equipped with Tool Ejectors, eliminate the need for hammers and drifts. The operator simply engages the Tool Ejector, grasps the tool with one hand and withdraws the spindle with the other. There's virtually no possibility of tool points striking the table. Operators save the time formerly spent groping for unnecessary tools. Drill, tap and reamer shanks stay smooth, keep your tools running right on center.

You don't need attachments—it's all done without special chucks, using standard taper shank tools.

THE TOOL EJECTOR is another "first" from Fosdick, design leader in drilling machinery, and *first* to apply hydraulics to Radial Drill controls. Remember, only Fosdick can equip its drills with the Tool Ejector.

CALL YOUR DISTRIBUTOR FOR MORE INFORMATION OR WRITE CINCINNATI DIRECT.

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
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THE FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

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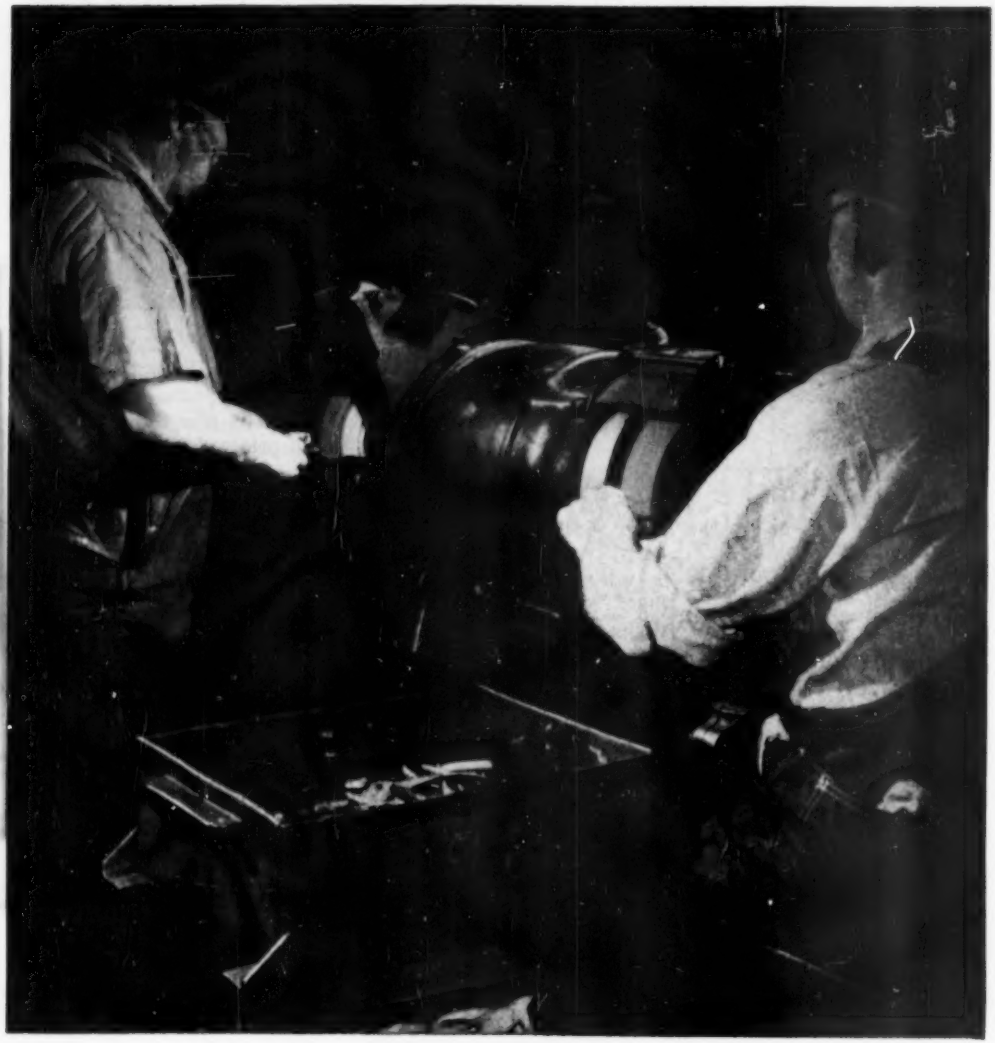
TO CUT COSTS ...ever think of



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TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York.

switching to an abrasive BELT?

Grinding and polishing techniques have undergone major improvements in the past few years. One of many revolutionary developments is the "61" contact wheel, used with a coated belt on many operations previously performed with a bonded or a set-up wheel. In every case, the change has been made for just one reason —to yield a better result at a lower cost.

This is the kind of change that spells progress to every metalworking man who is battling against higher and higher costs. And this is the reason why you should welcome the CARBORUNDUM man or distributor salesman when he calls on you. There is nobody quite like him, for he's not in the position of having to back just one type of product, or two. He alone has the ability to help you specify the one RIGHT combination of abrasive product and abrasive method for every operation in your shop.

His counsel is experienced, practical, and above all completely free from bias—for he represents the only complete line of abrasives, from CARBORUNDUM, the world's best known brand name in abrasives. We suggest that you call him in today—it's to your profit!

Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

RUNDUM

MARK

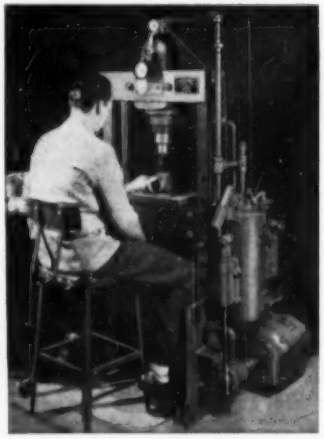
offers ALL abrasive products...to give you the proper ONE

You can't lick this stamp!

. . . It was done on a KRW Hydraulic Press . . . famous for doing all kinds of stamping work faster, better, at less cost!

Sometimes minor production operations can become major headaches. Take the case of Buffalo Meter Co., makers of water, oil and specialty meters. Stamping the serial number on the lid of each meter was formerly done on a hand press and caused no end of trouble. Sometimes the number would not register exactly on the plate; sometimes the operator applied too much pressure and the lid was sprung. It was slow, tedious, inaccurate work, hard on the operator.

Buffalo Meter solved the problem with a 25 ton KRW Motor Driven Hydraulic Press. Now one man can stamp upwards of 300 meter lids per hour — more than four times as many as before. Each number is in perfect register. And there are no more sprung lids because each stroke of the KRW press produces exactly the same amount of pressure. It's a small job, but it illustrates the value of a KRW hydraulic press for any stamping job.



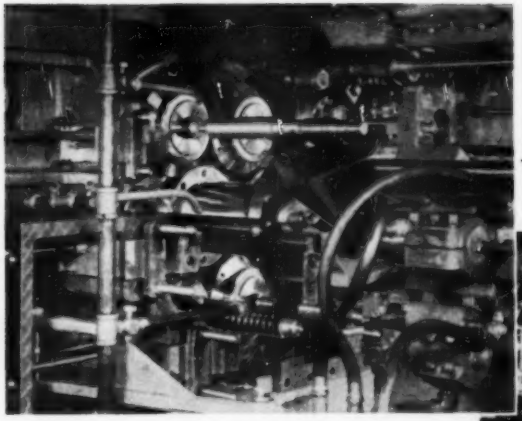
Any stamping or other pressing problems in your plant? Check with KRW. We have a full line—25 to 150 ton capacities; one, two and three cylinder models; hand operated, air operated or motor driven. If you need a *special* press, we'll build it for you.

Call your local Machinery dealer; or write, wire or phone Dep't. 11 for facts, prices and delivery dates.

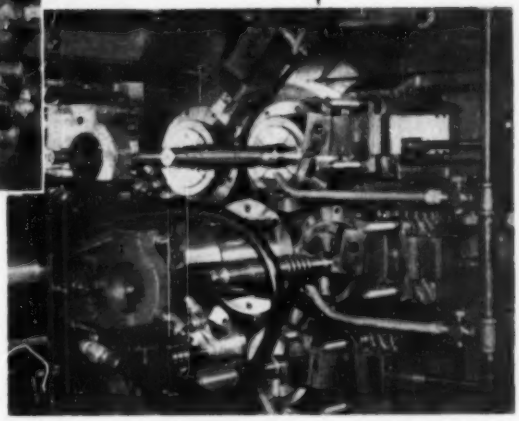
K·R·WILSON

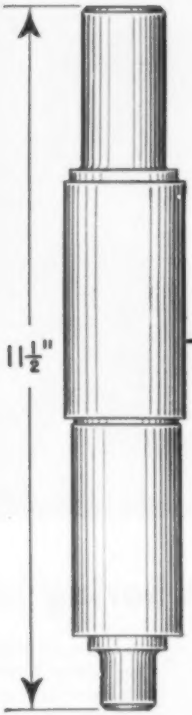
215 MAIN STREET • BUFFALO 3, N. Y.

Designers and builders of Hydraulic Presses to meet any metal-working problem



Tooling Area 3½ · SIX
Front Side Rear Side





Automotive Transmission Shaft

A very good reason why CONOMATICS handle a wider variety of machining operations per single chucking is their greater number of tooling positions.

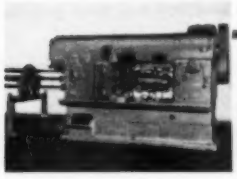
WITH MORE TO SELL THERE'S MORE TO TELL

Whether you're selecting a new golf club, motor car, or multiple spindle bar automatic, you want what best fits into the "scheme of things."

Before you can be sure that any product will meet your requirements you must have information. And you can judge only by that at hand or available. Complete information lets *you* decide what's important to *you*. That's as it should be.

There's always more information to be had about the product that has more to offer. It's that way about CONOMATICS. And you can always have *complete* information. If you will write, wire, or phone, you can have it now.

A Comparison of ALL Automatics is in favor of Cone



Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

STANICUT
TRADE MARK
Cutting Oil

A. A. Miller (center), general partner of Miller Products, and Donald Sanderlin (right), shop superintendent, tell Standard Oil's W. P. Spencer how STANICUT Cutting Oil reduced rejects on turret lathe boring job.

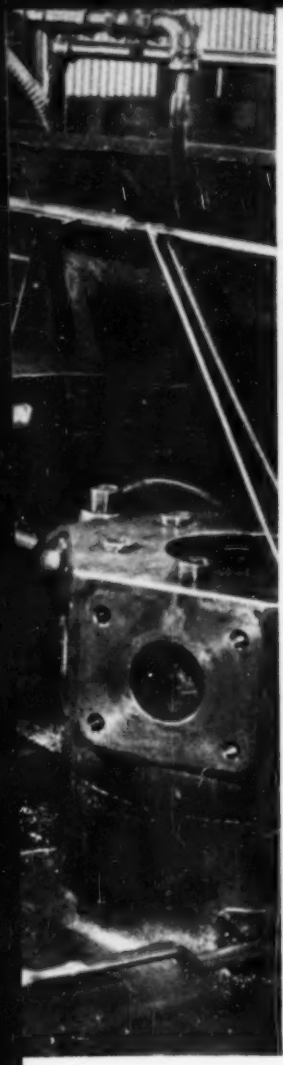
Ends taper troubles on boring job

● Miller Products of North Chicago, Illinois, used a turret lathe boring operation to produce dynamotor housings from 1015 steel tubing. Various cutting oils were tried on this job. With all but one of these oils, taper on the bore of the housings was excessive. In some cases, only one housing out of fifty was acceptable. STANICUT Oil 107 BC, recommended by a Standard Oil lubrication specialist, alone produced satisfactory results!

With the use of this cutting oil, taper has been kept to a minimum. Tool life and finish have been excellent. Production has averaged between 80 and 132 housings per tool change.

Of still greater benefit to Miller Products, STANICUT has proved its ability to handle a wide variety of difficult machining jobs. Operators have used it successfully on stainless steel, stress proof steel, and 4140 steel in turret lathes, automatic screw machines, and threaders.

Make the experience of Miller Products your basis for trying STANICUT Cutting Oil. You can get the help of a Standard lubrication specialist by phoning your local Standard Oil (Indiana) office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



What's YOUR problem?

W. P. Spencer, lubrication specialist in Standard Oil's Chicago office, worked closely with Miller Products to help them solve a serious machining problem.

To help you with similar problems, Standard Oil has a corps of lubrication specialists located throughout the Midwest. One of these men is near your plant. He is close-at-hand to give you the assistance you need when you need it. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings. You can reach him quickly and easily by phoning your local Standard Oil Company office. Arrange soon for his visit and find how you can profit further through Standard's unique service-supply set-up.

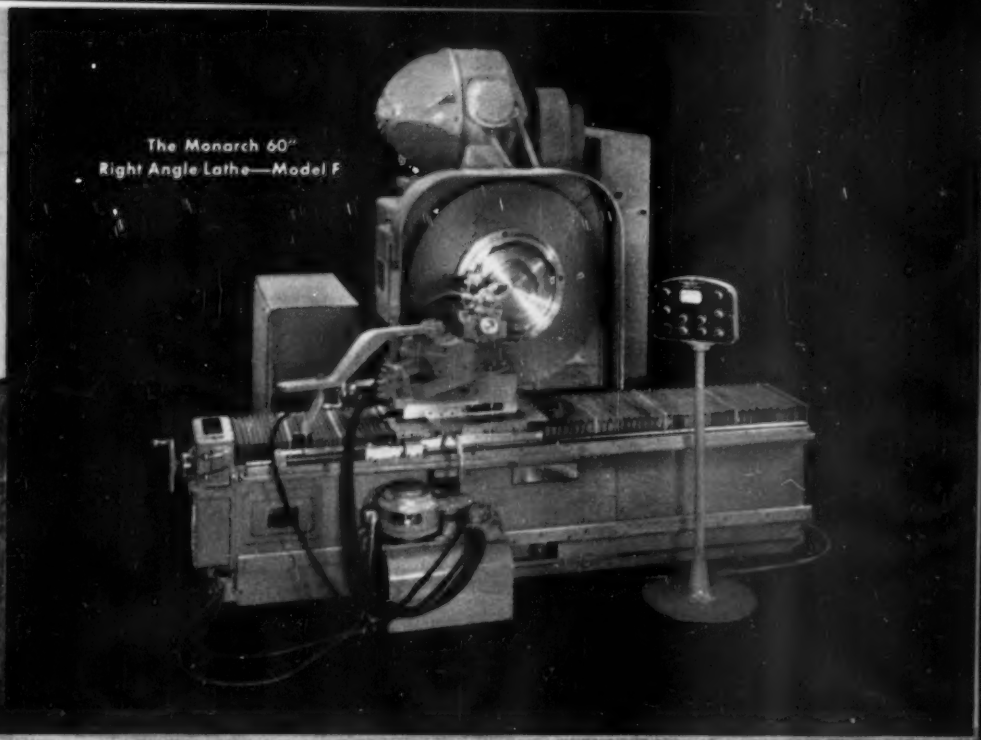
Send for this booklet

SEE WHAT STANOIL OFFERS YOU

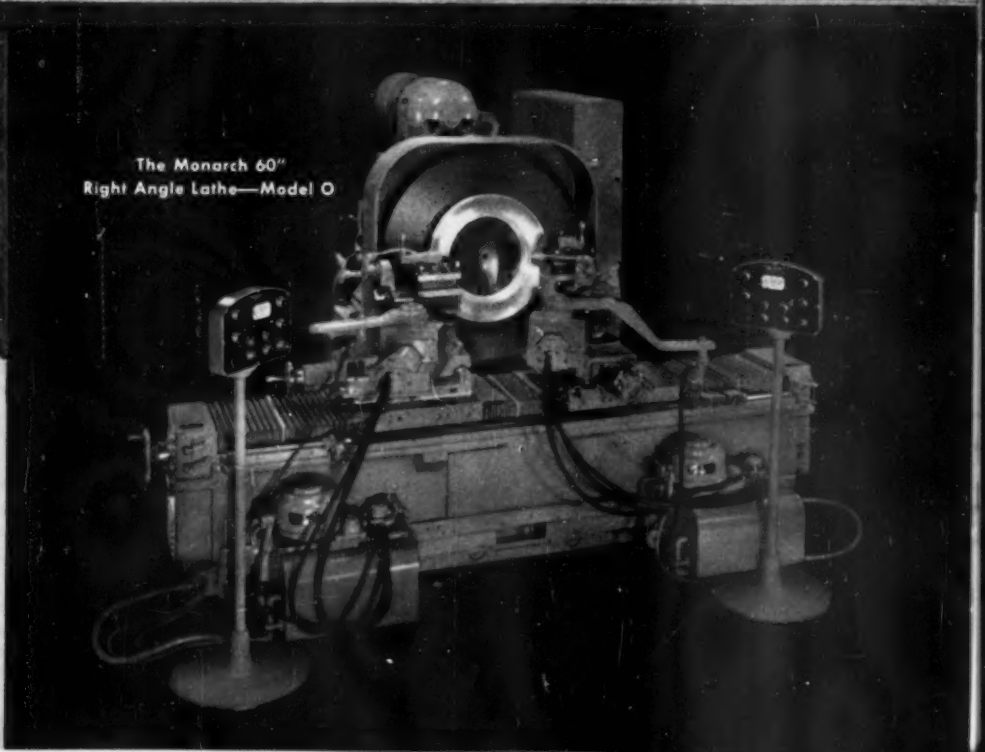
STANDARD

STANDARD OIL COMPANY
(INDIANA)

You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in a wide variety of equipment. Ask the Standard lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.



The Monarch 60"
Right Angle Lathe—Model F



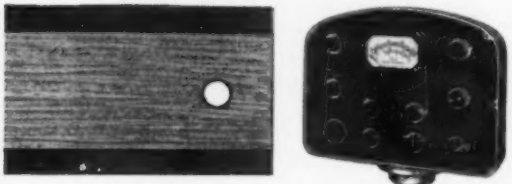
The Monarch 60"
Right Angle Lathe—Model O

2 Monarch 60″ Right Angle Lathes To Machine Jet Engine Parts To a "T"

BOTH with "Air-Gage Tracer" Control

Model F — Constant surface cutting speed — principally for facing.
Model O — Dual slides — principally for turning and boring.

These new Monarch lathes were developed to meet fully the exacting requirements of the jet aircraft industry. Model F is recommended particularly for finish facing of jet engine discs, wheels and other work of similar shape; Model O for finish turning and boring jet engine rings, vanes, shrouds and the like. All three classes of operations may be performed on either model. These machines are ideal for any type of thin-walled workpiece having large diameter and short length. Note these Monarch features:



★ Complete push button control. On machines with two slides there is a separate control stand for each slide. Turning cycle completely automatic.

★ Both longitudinal and angular cross feed infinitely variable. On double slide machines, use of separate feed motor drives provides any desired feed at either slide.

★ All slides provided with power angular feed. Model F machine has one "Air-Gage Tracer" controlled slide. Model O machine has two slides, either one or both of which may be "Air-Gage Tracer" controlled. On Model O machine, many workpieces may be produced complete at one chucking, in some cases with the two slides operating simultaneously.

★ No other tracer control method yet devised equals the Monarch "Air-Gage Tracer" in speed of accurate output. As all "Air-Gage Tracer" slides are of the swiveling type and are mounted on a power angular feed slide, there is practically no limitation to the direction of tool approach to the work. This versatility is necessary for the economical machining of many complex jet aircraft parts.

★ Headstock position adjustable over a total travel of 12″. This exclusive Monarch feature brings the work closer to the operator, thereby making loading and unloading easier. It also keeps tool overhang to a minimum.

★ Constant surface cutting speed feature for facing operations on Model F machine permits maintenance of satisfactory finish over entire face regardless of extreme diameter variation. Tool life is also measurably improved. Compared with the performance of a machine not having this feature, production is increased up to as much as 75%.

★ Either a 40″ or a 52″ face plate may be supplied. Work up to 60″ in diameter may be swung in gap as long as its thickness (or combined thickness of work and holding fixture) does not exceed 14″. All machines have power longitudinal feed for up to 48″ turn diameter.

Remember, above all other things, that the heart of the Monarch Right Angle Lathe is the "Air-Gage Tracer". This versatile duplication method has been time-proved on many hundreds of Monarch lathes of various types doing a vast variety of turning, boring and facing operations. You are invited to get the complete story by writing on your business letterhead for booklet No. 1401 . . . . : *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

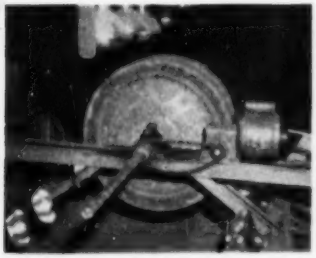
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Put these practical tips to work for you

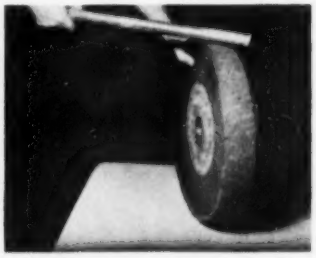
44-page book shows you how to set up metal polishing wheels and belts

Plan now to take advantage of the wealth of information in the Norton Booklet No. 1340, "Setting Up Polishing Wheels and Belts." This useful booklet tells how to prepare the glue, how to set up wheels using either glue or cement, how to set up abrasive belts, how to get the best results from polishing. It contains detailed information on abrasive grain for polishing, including tables for selecting grains. Norton Company, Worcester 6, Mass. Distributors in all principal cities. Export: Norton, Behr-Manning Overseas Inc., Worcester 6, Mass.

HOW TO SET UP a polishing wheel. Glued wheel, shown here, is automatically rolled in a trough of abrasive grain. To minimize jelling, the setting-up operation is carried out as quickly as possible.



HOW TO DRY a polishing wheel. Infrared lamps dry wheels faster and permit smaller inventory of wheels. Note mechanism for rotating wheels easily. Ideal dry room maintains temperature of 85° F. and 50% relative humidity. When wheel cracks readily, it is dry.



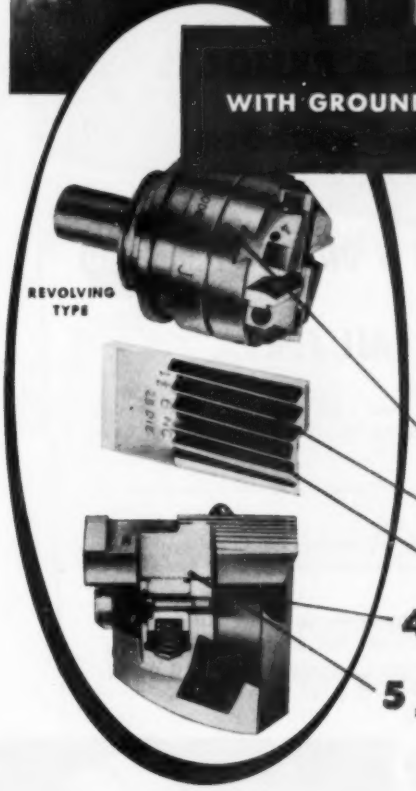
HOW TO CRACK the wheel head. Wheel face is hit at about a 45° angle, being struck completely around the wheel once or twice. It is then hit at an angle that forms an "X" with the first series of cracks. A round bar or pipe, *not a sharp tool*, is used.

NORTON

ABRASIVES

Making better products to make other products better

WITH GROUND THREAD TANGENT CHASERS



J&L Tangent Chaser Die Heads are rugged, dependable, time-tested tools. They are production engineered to produce better threads at speeds limited only by the material being threaded. Capacities are from #4 to 2″.

There is a J&L Tangent Chaser Die Head engineered for your requirement. Stationary types are available for turret lathes or any machine where the tool does not turn. Revolving types are for automatic screw machines, drill presses, threading machines, or any machine where the tool is held in a live spindle.

Among the many features contributing to their ability to perform your threading job faster and better are these:

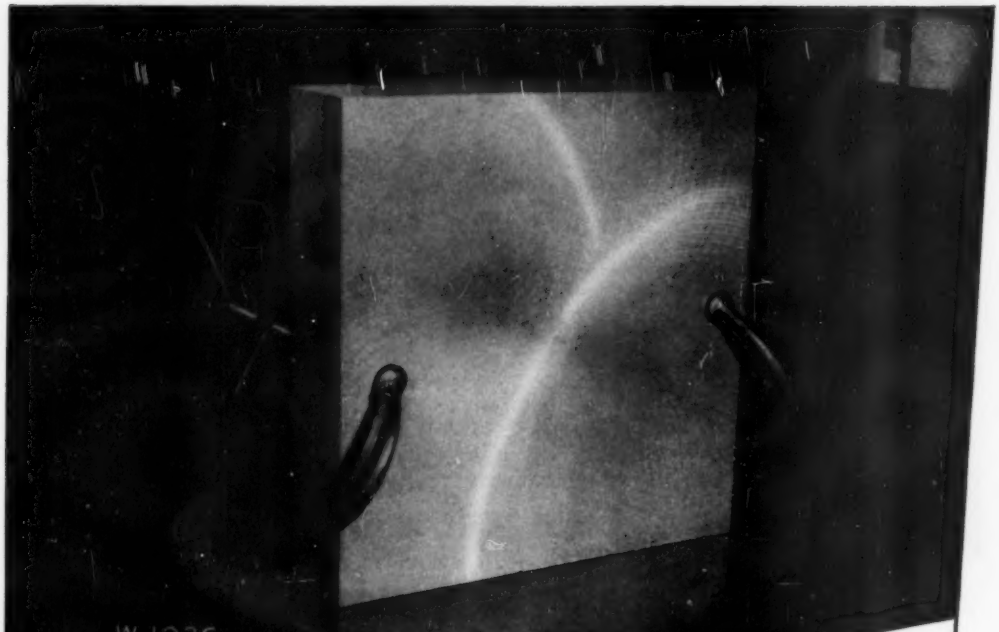
1. They are hardened and ground throughout. The chaser holding blocks are precision lapped for perfect fit into the dovetail slots in the body. Chaser cutting edges are held to a minimum distance from the die body.
2. Chasers are guaranteed to produce threads to Class #3 fit or better.
3. Exact helix angle is ground into the chasers after hardening. The result is a freer cutting tool—operating with a minimum of friction, heat and wear.
4. With a single set of chaser holders any standard thread within the rated capacity of the holders can be cut, regardless of helix angle. This eliminates the expense and trouble of constantly changing holders for different helix angles.
5. Chasers are changed and set quickly and easily, giving you more production hours each day.

Write to Department 710 for catalog on these and Radial Chaser Types and Dies for Brown & Sharpe machines.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. J&L **DIE HEAD DIVISION**



PUT IT ON THE BLANCHARD

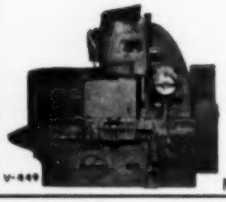
WHEN SPECIFICATIONS CALL FOR...

HEAVY STOCK REMOVAL — This steel block was torch-cut from a plate. It is 24 inches square and 6 inches thick. ⅛" of stock was removed from the broad surfaces, and ¼" from the 4 edges — a total of over 100 lbs.!

SPEED — A No. 18 Blanchard Surface Grinder, with extended column, ground this block on all 6 sides in only 6 hours.

ECONOMY — Not only did speed of stock removal roll up real savings, but the abrasive cost for the Blanchard Grinding Wheel, which was used for the job, figured less than 6 dollars.

CLOSE TOLERANCES — The block was held square in all directions to .002". Although this particular job calls for heavy stock removal, this same No. 18 Blanchard is fully capable of grinding to a dimension tolerance of ±.0001", a surface finish of 3 micro-inches, and flat within 3 light bands!

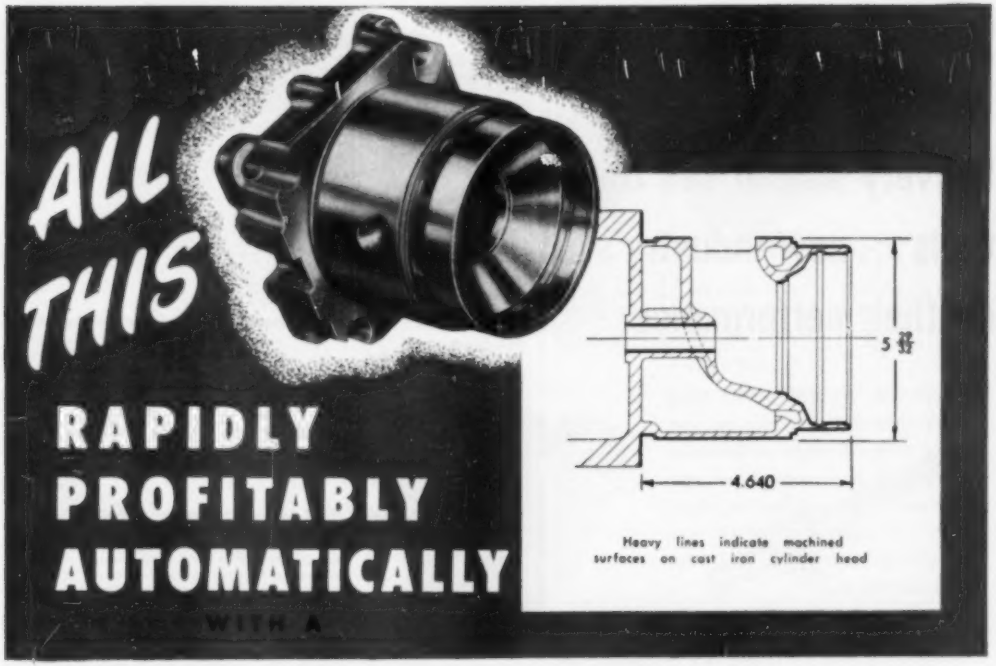


NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

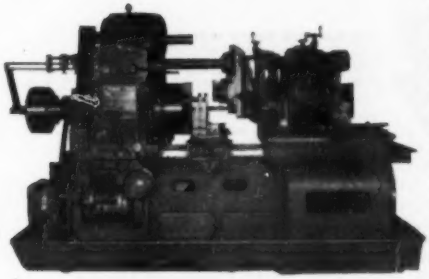
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE CO.
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



POTTER & JOHNSTON 5D *Power-Flex*

AUTOMATIC TURRET LATHE



The 5D Power-Flex — like all Potter and Johnston Automatic Turret Lathes — provides the power, flexibility and automatic operation needed for high output of close tolerance parts at lowest possible unit cost. Extra rigidity and permanent alignment mean long machine life, lasting accuracy and a long-term profit on your original investment.

For high-efficiency production of cast iron components like the cylinder head shown above — today's outstanding machines are Potter & Johnston Automatics equipped with P&J Precision Tooling. Based on more than a half century of specialized experience, this combination is your guarantee of more and better work and fewer rejects.

Interested in added productivity, precision and economy? Send today for this Bulletin. Remember—P&J engineers can help with your production problems. They'll recommend best combinations of tooling and operation sequence for low cost and high output. There's no obligation.

Precision Tooling Production for over 50 years

POTTER & JOHNSTON COMPANY

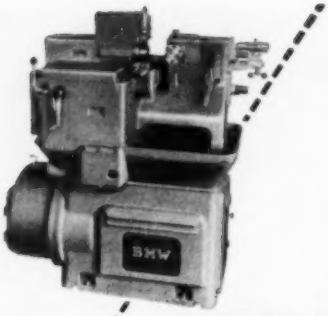
PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF PRATT & WHITNEY — DIVISION NILES - BEMENT - POND CO.

AVAILABLE FROM STOCK

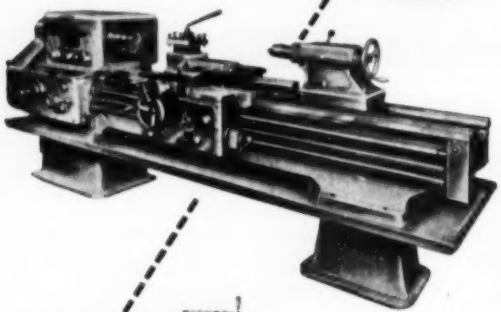
Delivery helped sell these tools... now Industry's sold on their performance

Production-minded plants want more than just delivery on machine tools—foreign or domestic. They want performance and reliable servicing—and they're getting both—reordering these German precision-built tools. Write for complete details.

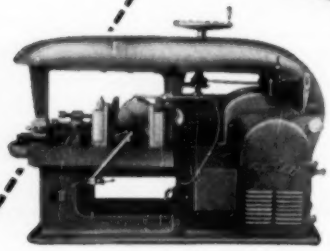


Automatic Screw Machine by BMW ...meets all U. S. operation and production demands. Collets interchangeable with American equipment. Single spindle. Designed to take full advantage of modern high-speed cutting tools. All cams, trips and stops easily accessible, can be positively locked. Bar capacity ⅝" diameter. Speeds up to 5800 rpm.

Hand Screw Machine and Turret Lathe for precise small runs. Small-batch production of formed parts from bar stock... turning cast or pressed components...finishing or secondary operations on pre-machined work—all can be handled much more economically on the HESTIKA HR-26 than on automatics or production-type turret lathes. Simple to set up: Short throw turret hand-feed can be used with 3, 4, 5 or 6 tools. Indexing of turret is automatic when retreating the tool. Single lever control for collet; normal spindle speed, threading spindle speed and reverse and spindle brake. Bed length 23½" with 1" collet capacity.



High-speed, Heavy-duty Engine Lathes with 17¾" swing and 39⅛", 59" and 78¾" turning lengths. All controls of GOEPPINGEN D225 are within easy reach of operator. 18 spindle speeds from 22-1120 rpm. Accurate settings maintained by single lever action of longitudinal and cross feeds carried in precision bearings. Cross-ribbed construction of lathe bed adds rigidity for heavy loads.



High cutting efficiency, easy-to-use Power Hacksaws. BERLETT machines with automatic feed are ruggedly built for trouble-free performance. Frame automatically returns by cam to start position. Wide vee guide of frame is adjustable. Pressure adjustments without weights. 3 cutting speeds. Sizes: 6", 8", 10", 12" and 14".

Send for current stock list

Lathes	Grinders
Milling Machines	Drill Pointers
Jig Borers	Power Hack Saws
Thread Grinders	Screw Machines
Drill Presses	Balancing Machines
Shapers	Broaching Machines

Replacement parts for all machines will be available at our Cleveland Service Center

KO CO. INC. INDUSTRIAL IMPORTERS

KURT ORBAN COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35

Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada

AS A SHAFT . . . Rollpin serves as an axle for the sparkwheel of a cigarette lighter. No riveting or threading necessary . . . faster assembly. Note flush, clean fit.

AS A DOWEL . . . Rollpin is used here to prevent rotation of a thrust bearing. No reaming, no special locking. Easily removed. Lowest possible dowel pin cost.

AS A CLEVIS PIN . . . here Rollpin holds firmly in clevis, permits free action of moving member. Rollpin application above is with the plate of a home workshop tool.

AS A KEY . . . Rollpin demonstrates its ability to do away with precision tolerances, in this heating system damper arm. Faster, cheaper and more satisfactory than usual assemblies.

AS A STOP PIN . . . in this application, Rollpin is shown in a ratchet wrench adaptor. With its light weight and high shear strength, Rollpin functions perfectly . . . cuts assembly costs.

AS A SIMPLE FASTENER . . . Rollpin replaces a set screw in pinning a gear to a shaft. Assembly time is shorter, service life longer. Vibration-proof flush fit. Easily removable.

YOUR IMPORTANT FASTENING JOBS

are cheaper . . . faster, with ROLLPIN

TRADE MARK

Rollpin is a pressed-fit pin with chamfered ends. It drives easily into holes drilled to normal tolerances, compressing as driven. No reaming, no tapering, no extra assembly steps required. Rollpin fits flush, *locked* in place by the constant pressure it exerts against the hole walls. Can be inserted with automatic press, or by hand—removable with a drift or pin punch.

Rollpin is reusable again and again.

Elastic Stop Nuts with the famous red collar are another ESNA product

ESNA

MAIL COUPON TODAY. If your present operations or plans include the above applications—or set screws, rivets, hinge pins, cotter pins, pivot pins, taper pins—you can't afford to be without complete details on Rollpin. Write now—find out how much faster and cheaper Rollpin can do the job.

Section RI-79, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, N. J.

Please send me the following free information on ESNA self-locking fasteners:

☐ Rollpin bulletin and sample Rollpins ☐ AN-ESNA conversion chart
☐ Elastic Stop Nut Bulletin ☐ Here is a drawing of our product. What fastener do you recommend?

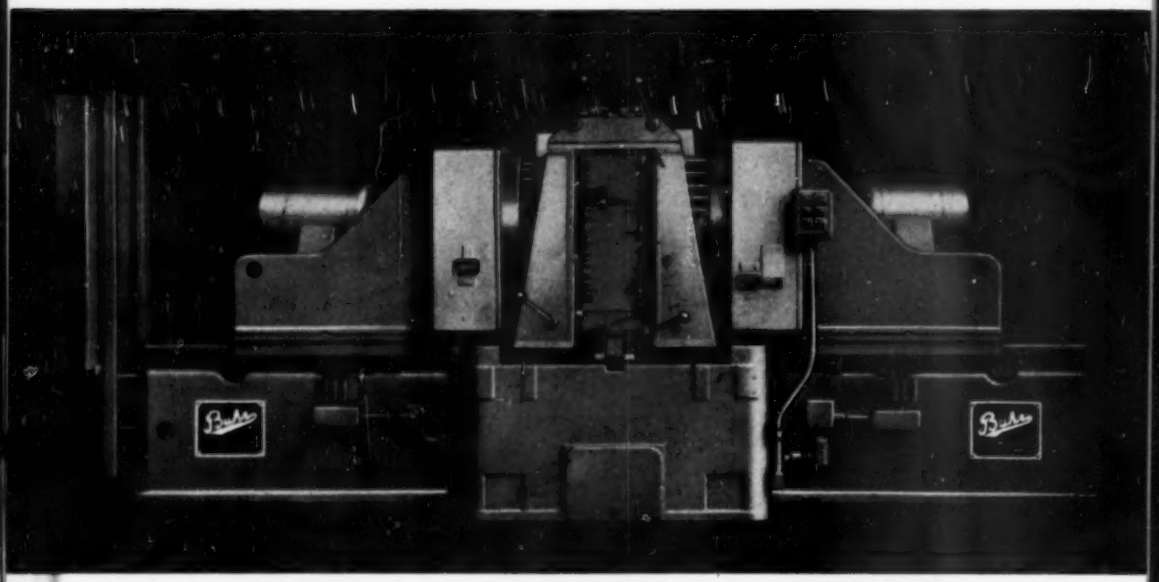
Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____

HERE IS WHAT STALIN HATES!



It's not tanks, planes, guns, ships, atomic bombs and armed forces that Joe Stalin hates . . . It's the productive power behind them—productive power that is symbolized by this Buhr Two-Way Hydraulic-Feed Drilling Machine which is now hard at work day-in and day-out . . . helping one of the world's largest manufacturers turn out automatic transmission cases for tanks . . . This kind of Machine —more than anything else—is what Stalin hates.

Industries Turn to Machinery Like This . . . which Performs 93 Operations at Once

To help stymie Stalin, one of the world's largest engine makers was awarded an enormous defense order. Production had to get under way as quickly as possible!

One of Their Problems

To drill, ream and chamfer this automatic transmission case—that was one of the problems.

To handle this very important phase of their production, they turned to Buhr.

What the Machine Does

In general—it drills, counterdrills and countersinks 41 holes in front end of transmission case . . . and drills, counterdrills and countersinks 52 holes in rear end of case.

Specifically, the Machine accomplishes this—

From the left:

Drills (1) 25/32″ diameter hole through
Drills and counterdrills (28) #1 holes
Drills and counterdrills (8) #2 holes
Drills (1) 29/32″ diameter hole through
Drills (1) 7/8″ diameter hole 3/4″ deep
Drills and countersinks (2) end cover dowels on vertical center.

From the right:

Drills and counterdrills (11) #1 holes
Drills and counterdrills (8) #2 holes
Drills (12) #3 holes through
Drills and counterdrills (12) #10 holes
Drills and counterdrills (1) #19 hole
Drills and counterdrills (8) #6 holes

Production: 40 pieces per hour at 100% efficiency.

Why They Turned to Buhr

Buhr is an old and trusted friend by many of the leading U.S. Industries. Many have turned to Buhr for the past quarter-century. Their manufacturing facilities are excellent. In sales, engineering and production, Buhr has trustworthy and experienced staffs—staffs that are specialized in this field and able to service every part of the Country.

To Find Out About Buhr

This 48-Page Catalog . . . as well as one of our Sales Engineers . . . are at your beck and call. For every problem involving this type of Special Machinery—including defense production to halt Stalin—phone, wire, or write us.

BUHR MACHINE TOOL CO.
Ann Arbor, Michigan
Phone: Ann Arbor 2-5646—5980
Detroit WOodward 3-2126

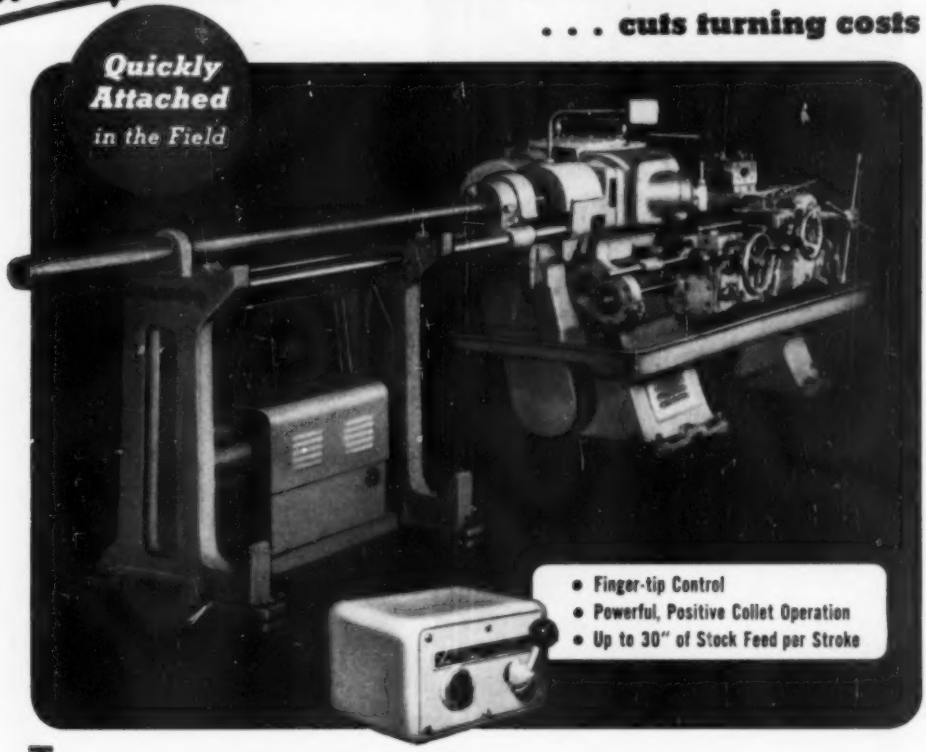
Buhr ***SPECIAL MACHINERY . . . Leaders Make Sure with BUHR***

Power Operated

COLLET CHUCK AND BAR FEED

Increases production

. . . cuts turning costs



This new, work-saving development is a rigid, heavy-duty hydraulic unit built to handle full capacity bars at full capacity spindle speeds.

It provides effortless finger-tip control of bar feeding and chucking, enabling operators to *maintain a faster, steadier pace throughout the day.*

It can be attached quickly to ANY J & L No. 3, 4, 5, 7A and 8A Universal Turret Lathe in the field.

★ Handles ● ■ or ● stock
★ Side-loading, silent safety tube
★ Heavy, wide support legs
★ Levelling and floor lagging screws
★ Wide-spaced steel guide bars
★ Feed chuck mounted on anti-friction bearings
★ Independent hydraulic unit
★ Automatic strip-back cycle
★ Auxiliary feed chuck available

Turret Lathe Division **JONES & LAMSON** J&L

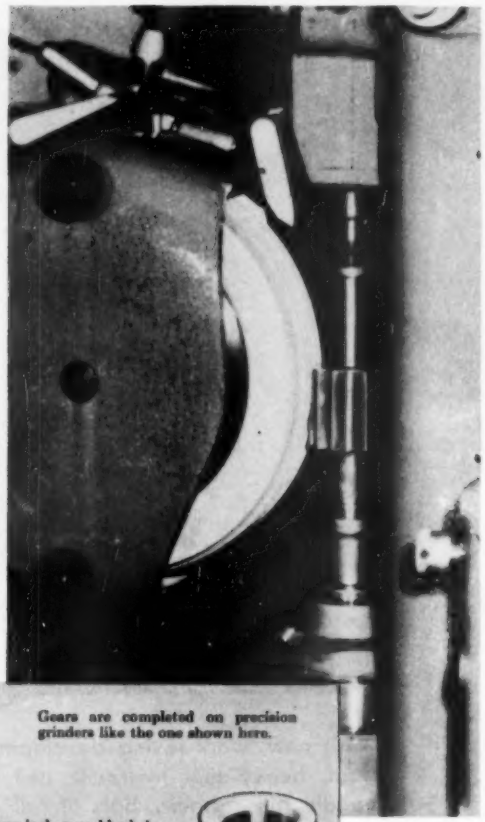
MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

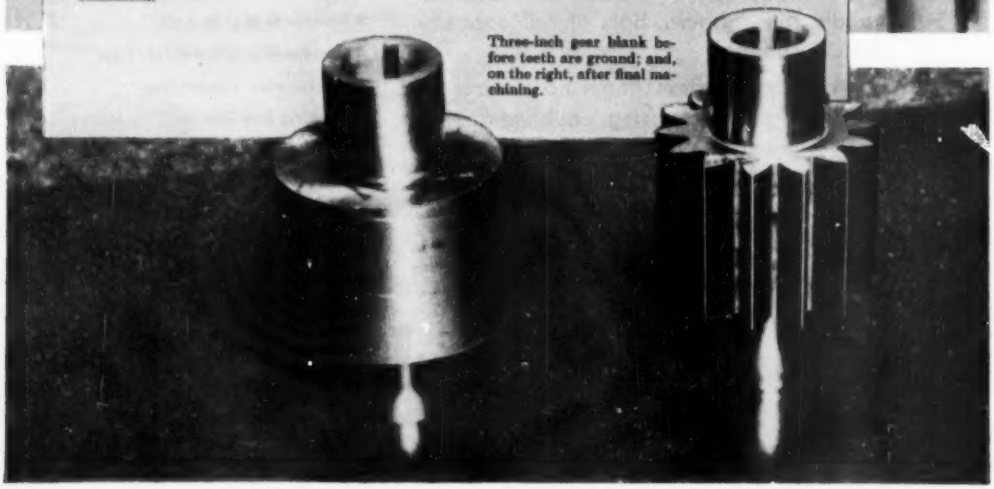
✓ *Write to Dept. 710 for Complete Information*

"Lean Carilloy

At Commercial Shearing and Stamping Company, gears are machined directly from bar stock. Since the change from rich to lean alloy steel, the need for normalizing and straightening the metal before machining has been eliminated.



Gears are completed on precision grinders like the one shown here.



Three-inch gear blank before teeth are ground; and, on the right, after final machining.

alloy steel is saving us $40 a ton ...with no loss in performance."

—T. C. Kane, Chief Engineer

Commercial Shearing and Stamping Co.

In gear-type rotary pumps, speeds are exceptionally high—up to 2000 rpm; and pumps operate at pressures as high as 1500 psi. At Commercial Shearing and Stamping Company, gears for this severe service are now made of straight-chrome instead of nickel-molybdenum steel.

LIKE MANY other manufacturers who, today, cannot get rich alloy steel, Commercial Shearing and Stamping Company of Youngstown, Ohio, has found that many parts that must operate in extremely tough service can be made of *lean* alloy steels with no loss in performance.

Commercial Shearing makes a wide variety of steel products, including stampings and forgings; but it is in their gear-type rotary hydraulic pumps that they must do without rich alloy steel. Choosing a satisfactory alternate steel for the precision gears in these pumps presented quite a problem.

Mr. T. C. Kane, Chief Engineer at Commercial, tells the story this way: "We used to make the gears for our heavy-duty hydraulic pumps out of Carilloy 4615 (a Ni-Mo steel, with 1.65-2.00% nickel). But when nickel started getting scarce, we had to find a steel in better supply that would stand up in this severe service.

"Our gear-type rotary pumps are used in heavy-duty hydraulically-operated mobile equipment and must deliver a constant supply of oil at the correct pressure. In these pumps, oil is trapped between the teeth of two meshing gears and forced through the pump as the gears rotate. To obtain the high efficiencies necessary, gear dimensions must be held within extremely close tolerances. And wear must be held down, because a loss of just 0.005 inch causes a substantial drop in pump efficiency. These pumps operate at pressures as high as 1500 psi and speeds up to 2000 rpm; so we have to be sure to use a tough, wear-resistant steel for the gears. The question was, how to get this in a lean alloy steel.

"One of United States Steel's service metallurgists helped us out. After analyzing our requirements, he suggested a straight-chrome alloy steel—Carilloy 5120. Now that we have lived with this steel for a while, we are frankly surprised at the excellent results we are getting. Not only are our pumps as good as ever, but this straight-chrome steel has important advantages for us over the richer alloy:

"First of all, Carilloy 5120 is easier to machine, so naturally our tools last longer.

"Our heat treating problems are easier, too. Carilloy 4615 had to be normalized and straightened before machining. This is no longer necessary since there is less distortion in carburizing operation.

"With reduced heat-treating costs and a lower grade extra, the change to lean alloy steel is saving us $40 on each ton of steel we buy."

★ ★ ★

The switch from rich to lean alloys is not always as easy as it was at Commercial Shearing and Stamping Company. You may require special heat treating, or simply more *careful* heat treating, to obtain desired mechanical properties. But whatever your steel problems, our metallurgists will be glad to help you with them. Just call the nearest District Sales Office or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S Carilloy Steels

USS

UNITED STATES STEEL COMPANY, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

2-1250

UNITED STATES STEEL

Assembly Problem?

Use Black & Decker Screw Drivers for faster work, tighter assemblies, fewer rejects, less operator strain!

New No. 12 Positive Clutch SCRUGUN*

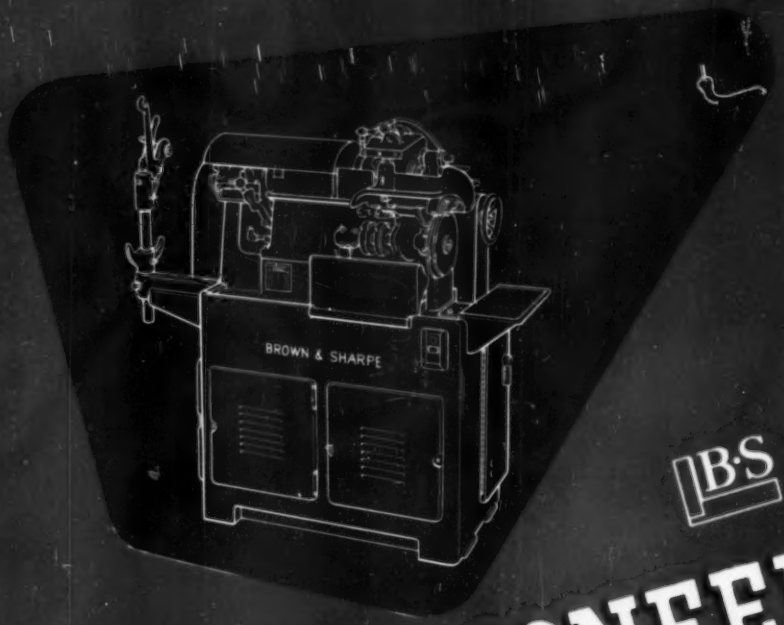
WHATEVER your assembly problem . . . pick the tool with the *correct* power, speed and capacity to solve it . . from the big, diversified Black & Decker Screw Driver Line! Choose from 21 models for driving everything from No. 4 screws to $\frac{5}{8}$" diam. nuts . . models with positive clutches for "free-hand" driving . . . with adjustable clutches for driving to uniform, predetermined tightness . . with 90° angle heads for working in close quarters or around corners.

Heft a B&D Screw Driver and see why its balance, compactness and light weight mean easy handling. Pull its trigger switch and feel the surge of power that spells top-speed performance. Check its quality-built features and get the reasons why it turns out accurate, uniform work. See your nearby Black & Decker Distributor for a demonstration, for expert help on any assembly problem. Write for free catalog to: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Maryland.

BLACK & DECKER 33 Factory Branches SERVICE

. . . use them to save time, trouble, money!

*Trade Mark Reg. U. S. Pat. Off.



B·S

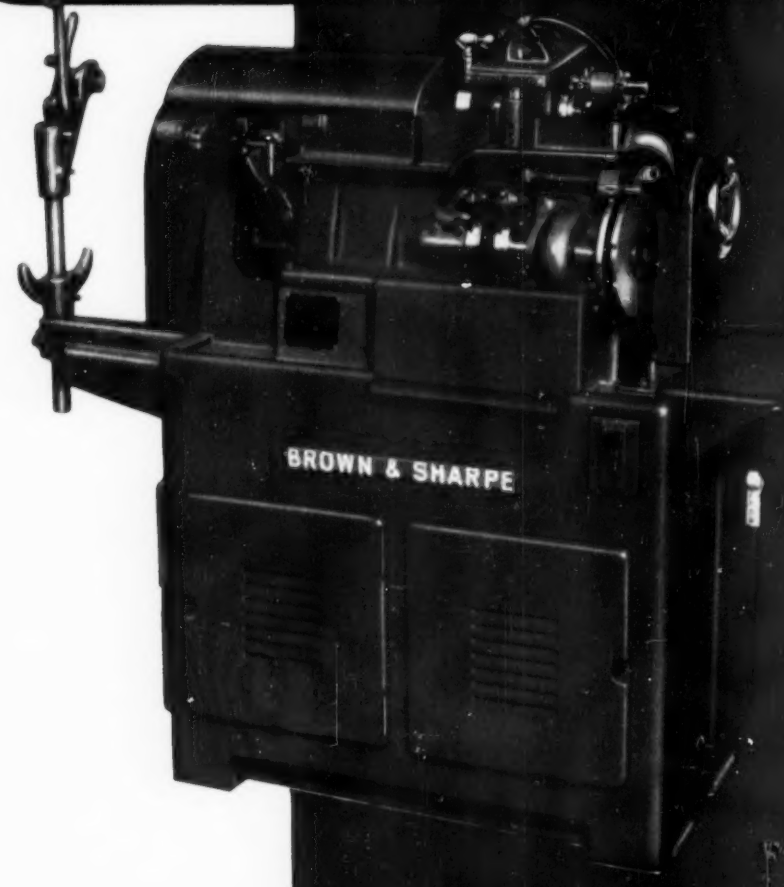
PRODUCTIONEERED

Equipment for Every Screw Machine Department

With maximum production dependent upon your selection of the *right* machine for the job, and the *right* tools for the machine, it pays to give first consideration to the comprehensive line of screw machines and tools offered by Brown & Sharpe. This equipment is specifically designed for maximum productivity — *"Productioneered"* to maintain steady high-level output and uniform accuracy with a minimum of skilled supervision.

for

maximum output with minimum skilled supervision



AUTOMATIC PINION TURNING MACHINE

If your manufacturing calls for high-level production of close-tolerance, fine-finish assemblies such as clocks, timers or military fuses, the Brown & Sharpe Automatic Pinion Turning Machine can be doubly valuable to you. It equips you for volume production of extremely uniform staffs and pinions . . . and it relieves your need for expert pinion turning specialists. Designed with simple, accuracy-protection features such as a tool adjusting dial indicator on swing arm, permanent-contour circular-formed single-point tools, and individual micrometer stop on each tool. Takes stock to ¼" diam.

Brown & Sharpe

for higher production,
greater efficiency

AUTOMATIC SCREW MACHINES

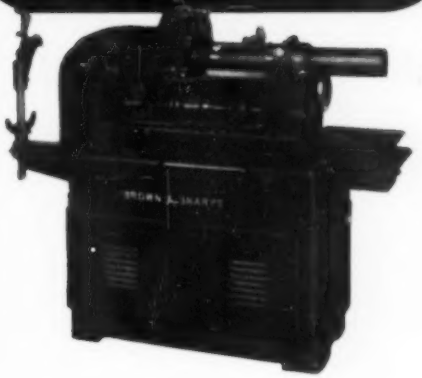
Uniformly rapid non-cutting movements combined with high cutting efficiency make these Brown & Sharpe Automatics consistently high producers. No. 00G takes stock to ⅜" dia., No. 0G to ⅝" dia. and No. 2G to 1" or 1½" dia. New No. 4 takes stock to 1½" dia. (to 2⅝" where work permits).

AUTOMATIC SCREW THREADING MACHINE

Small parts requiring threading, forming, cutting-off and slotting operations can be produced on this machine at unusually high production rate and minimum unit cost.

for high speed production of
small screws, pins, bushings

for smooth-end cutting-off
in a single operation

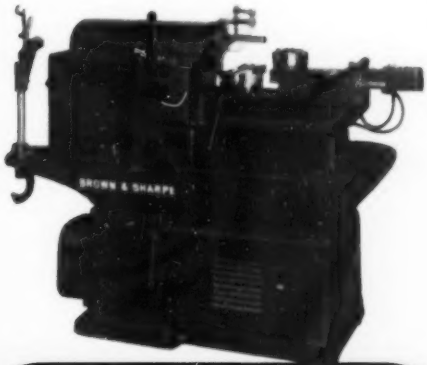


AUTOMATIC CUTTING-OFF MACHINE
Opposed Spindle Type

Designed to produce form and cut-off work with no teat on the cut-off end. Work is held securely, not only in the work spindle, but also in the opposed spindle. Wide range of production rates from ¾ second to 45½ seconds per piece. Takes stock to ⅜" dia.

NEW! HAND SCREW MACHINES

Fast and profitable for small quantity runs of bar work and second operations, these machines use many of the same tools, collets and fingers as the automatics. Worthwhile addition to any screw machine department. Three sizes, Nos. 00, 0, and 2, take stock to ⅜" dia., ⅝" dia. and 1" dia. respectively.



for simpler set-ups,
smaller-quantity runs

PRODUCTIONEERED

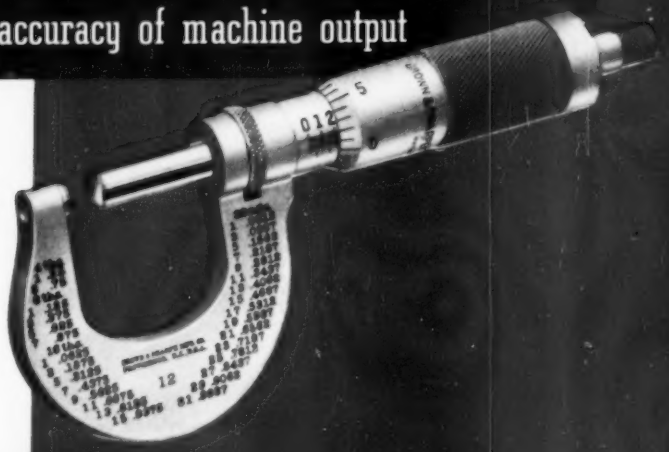
to maintain accuracy of machine output

NEW

BROWN & SHARPE MICROMETERS

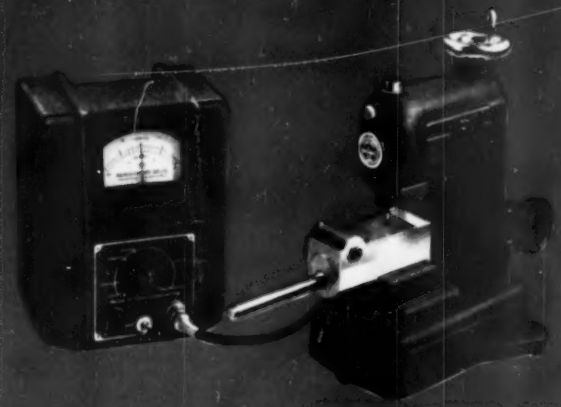
The ease of handling, clarity of reading and unvarying accuracy of the new improved Brown & Sharpe Micrometers give them added value in preventing high rejection rates under today's stepped-up production.

Advanced features include carbide measuring faces, dull chrome finish, one-piece stainless steel spindle with hardened, ground threads, simplified adjustments.



BROWN & SHARPE ELECTRONIC GAGING EQUIPMENT

This equipment permits precision gaging and inspection, at high speed, with human error practically eliminated. It amplifies gage measurements 1800 to 18,000 times . . . enables operators to read ten-thousandths as easily as inches, and as fast as parts can be handled.



WE URGE BUYING THROUGH THE DISTRIBUTOR

BROWN & SHARPE SCREW MACHINE TOOLS

Strong, durable, simple in design and easy to adjust . . . Brown & Sharpe Screw Machine Tools provide maximum production, accurate work and good finish at low cost. Made in wide ranges of types and sizes for external turning, for holding internal cutting tools, for threading, knurling, forming and cutting off.

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Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters
Machine Tool Accessories • Machinists' Tools • Johansson Gage Blocks
Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

42 SECONDS—FLAT!
. . . a new threading record
for the CRI-DAN "D"
Product: Diesel Engine Stud
Size: 2½" Diameter; 2½" Thread Length; 4-pitch thread
Material: 4150 S.A.E. Steel
30-32 Rockwell "C"

Here's another example where the fabulous Cri-Dan "D" threading machine licked a tough threading job in *seconds* that would have normally taken *minutes*.

This time the part was a Diesel Engine Stud, 2½" in diameter in which a 4-pitch thread 2½" long had to be cut in 4150 S.A.E. steel.

The well-known company* doing the job reports phenomenal results in accuracy as well as speed using the Cri-Dan "D" with a single carbide tipped tool.

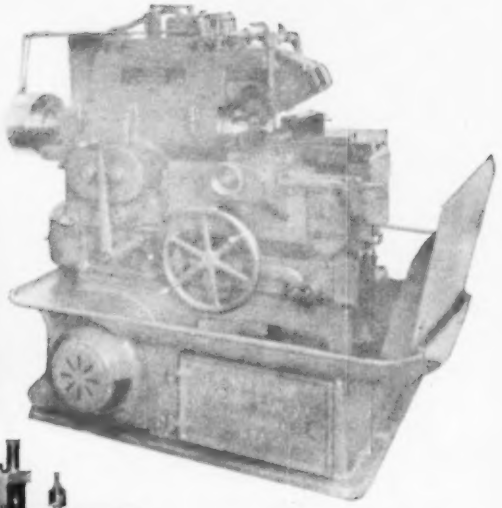
Whether you have an unusually tough threading problem where accuracy is at a premium, or a threading operation you'd like to speed up, by all means check with your Lees-Bradner representative and get the facts on the Cri-Dan "D".

*Name on Request

The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

New Design Features Plus Automatic Cycling Increases Production From 40 to 250 Gear Blanks Per Hour



The Sundstrand Lathe above, was built in 1930 and had manual approach and return — It represented a modern production lathe of that time, turning 40 bevel gear blanks an hour.

This modern Sundstrand Automatic Lathe, with its new design features and automatic cycling, today turns comparable bevel gear blanks at the rate of 250 an hour.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Some of the design features that make this production possible

The 8000 or more users have always found Sundstrand Automatic Lathes a profitable investment. Many have changed from old to new Sundstrand Automatic Lathes in order to get even higher productivity as a result of design improvements. The following features incorporated in the design of the latest models of Sundstrand Automatic Lathes will help you increase production.

Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Faster Set-Up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Quick Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-Clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

FREE ADDITIONAL DATA

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for Bulletin 121.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

MODERN MASTERPIECE by U.S. Industry

S.S. United States, New Flagship of American Merchant Marine, Protected by World's Greatest Lubrication Knowledge!

SAILING on her maiden voyage this summer, the 990-ft. S.S. *United States*, largest and fastest liner ever built in America, represents a cross section of U. S. industry . . . a composite of industrial lubrication problems.

Every state contributed to her construction, more than 800 firms supplied materials. Represented are the steel and aluminum industries, metal working, power generation, air conditioning, refrigeration, chemical, textile, plastics, electrical—many others.

Lubrication a Big Problem

The cutaway view shows a small portion of the machinery that powers and operates this world's

Designed by Gibbs & Cox, Inc. Built by Newport News Shipbuilding and Dry Dock Company.

most modern ship. It also indicates why the S.S. *United States* — containing many of the same machines found in plants, mills and mines — presented lubrication problems as complex as any ever encountered in industry.

To solve these problems — to protect giant steam turbines, intricate hydraulic systems, generators, compressors, precision instruments and controls — United States Lines called on Socony-Vacuum.

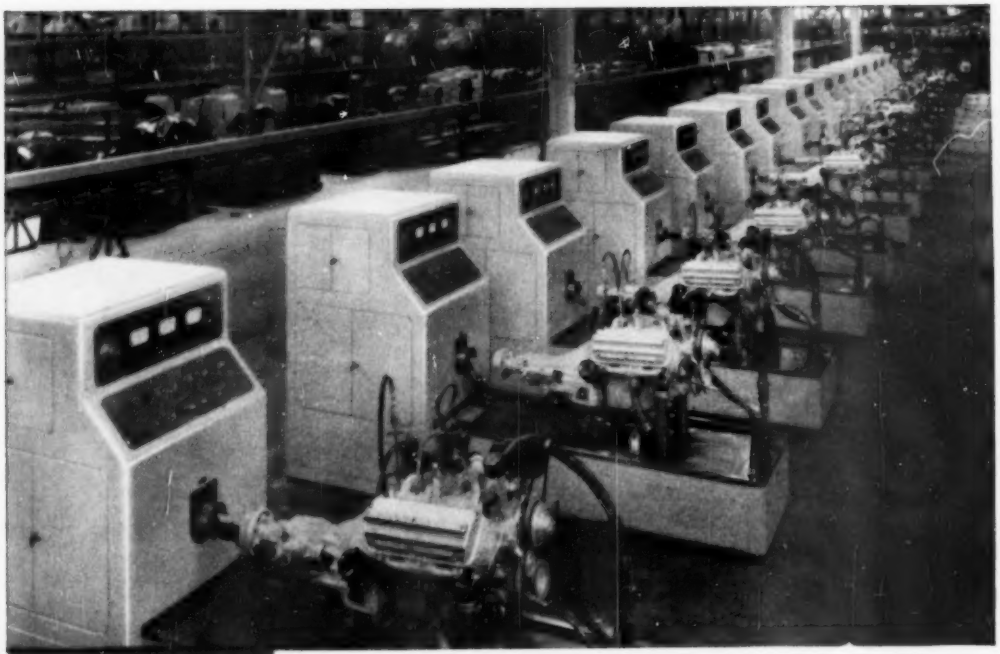
Today, the S.S. *United States* is protected stem to stern by a complete program of Correct Lubrication. This same unsurpassed protection is available to *you*. Why accept anything less?

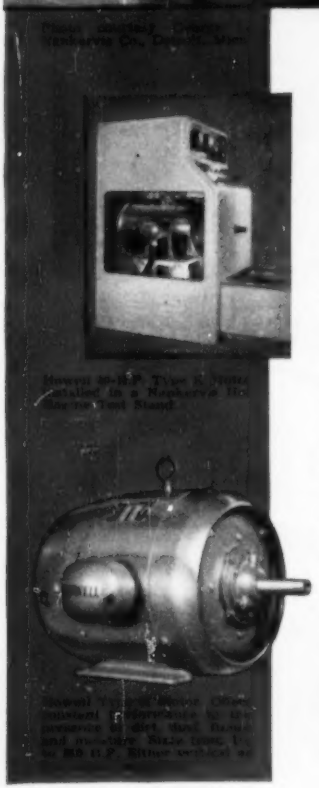
SOCONY-VACUUM

Socony-Vacuum

Correct Lubrication

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION





New test stand proves performance before engine meets chassis!

In these Nankervis Hot Engine Test Stands, installed in one of the country's newest automotive engine plants, 40-H.P. Howell Motors act as the test load for new engines. It's an unusual application for electric motors, but Howell Motors handle the job easily.

Here, inefficient engine operation from poor carburetion, timing, ignition, etc., is detected immediately when horsepower does not reach prescribed standards. Faulty parts can be quickly replaced or adjustments made while the engine is still on the stand.

Testing procedures like this one make special demands on the electric motors. Highest accuracy is a must. Howell Motors' superior design, quality materials and precision construction assure the performance necessary for exacting operations.

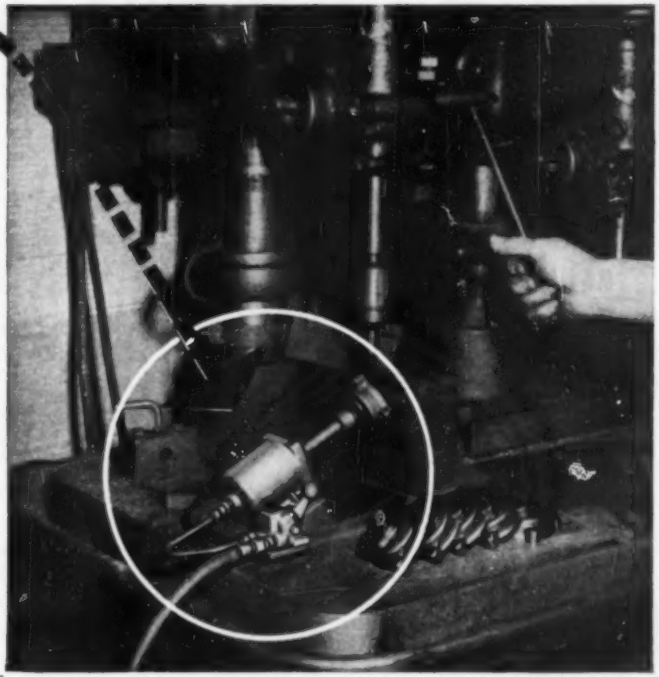
You, too, can benefit by using Howell engineering services and precision-built Howell Motors from 1/6 to 250 H.P. in standard NEMA frame sizes. Howell Motors do your tough jobs better, and at the same time give you economy through long life and trouble-free operation. It will pay you to contact the Howell representative in your city or write to us today.

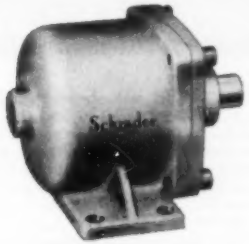
HOWELL Red Band MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built industrial motors since 1915

Simplify any work-holding problem





ClampAir Cylinder

Watch a worker making ready for a simple drilling operation. He places the work in a fixture and hand-clamps it. With everything all set to go, you'll find he takes as much as ten seconds just to grip the work tightly in the clamp.

Multiply that by thousands of machining operations in a normal high production shop. You'll find a substantial portion of work time is used up before actual production is begun.

You can eliminate nearly all of this lost time with the new Schrader ClampAir. What's more, since the ClampAir takes no more effort than opening a valve, high-priced workers are not tired by useless labor.

The ClampAir is actually a bantam air cylinder, with plenty of power to hold work firmly in place—with the same holding force every time. That means the end of rejects caused by inconsistent holding forces.

The number of places where ClampAir can serve you well is on drill presses, milling machines, gluing operations, and others too numerous to mention. In all of these, production rates can be upped to higher percentage brackets with ClampAir. And, since ClampAir is basically a push type cylinder, it can be used in many other spots where you need a short, hard stroke.

It's easy to find out how ClampAir can shorten production time, increase worker efficiency. Write, outlining the applications in which you are interested—or fill out the coupon below. We will be glad to help you determine your needs.

Schrader
REG. U. S. PAT. OFF.

products
control the air

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

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A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn 17, N. Y., Dept. F-5

I am interested in more information on.....

Name..... Title.....

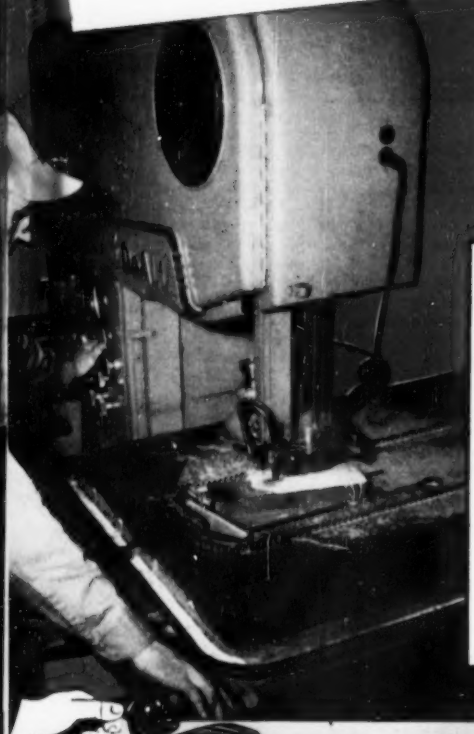
Company.....

Address.....

YOU CAN BENEFIT FROM

Use the DoALL method for fast low cost machining. Shape and save all types of material. Release larger expensive tools for more profitable operations.

DoALL CONTOUR-MATIC—Finest, most useful band machine built. Variable tool speed 40 to 10,000 feet per minute. Saws, files, polishes, grinds, hones, slices all materials. Hydraulic operation with finger tip controls delivers increased production at lower cost.



BAND TOOLS FOR EVERY PURPOSE

—precision, buttress, claw tooth, spring temper and friction saw bands; line grind, diamond and file bands; scallop edge, spiral edge and knife edge bands; abrasive bands. Ask for catalog.

DoALL'S PAY PRICED AS LOW

WHATEVER your band machining requirements, you can find the right model in the DoALL line. There are standard machines to meet almost every conceivable requirement: seven frame sizes; five throat sizes; speeds from 40 to 15000 f.p.m.

There is a fixed speed, 16" throat *Utility* bandsawing machine for only $350. There is a combination bandsawing, filing and polishing *Utility* model having a dual variable speed range and attached saw blade welder for only $750—*the biggest bargain available anywhere in a band tooled machine.*

There are the big, high speed DoALL *Zephyr* machines, to handle work loads weighing a ton or more and with Hydro-Feed tables for fast, labor-saving production.

The DoALL *Contour-matic* is unmatched in operational scope, quality of work and productivity.

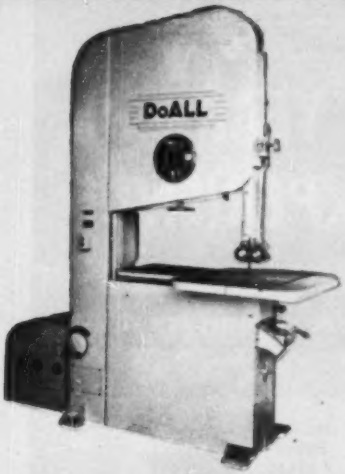
PRECISION SURFACE GRINDERS

GAGE BLOCKS

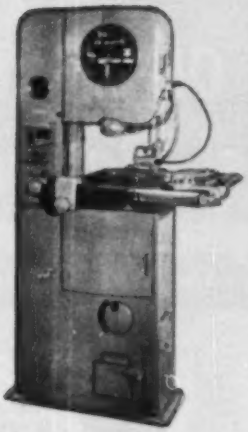
GAGING EQUIPMENT

MOBILE INSPECTION UNITS

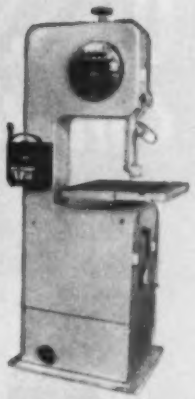
DoALL BAND MACHINING!



DoALL "ZEPHYR" MACHINES—For safe high speed sawing, up to 15,000 fee.. per minute. Widely used for Friction Sawing. Single or variable speed models—16" to 60" throat capacity. Pedal operated or automatic brakes optional on high speed machines.



DoALL CONTOUR MACHINES—For precision bandsawing, filing and polishing in every type of metal working shop. Effortless and precise control of speed and feed result in exceptionally efficient operation and reduced tool cost. Available in 16", 26", 36" or 60" throat capacity with work height under guides as required.



DoALL "UTILITY" MODELS—Light duty low cost bandsawing machines. Fixed speed for plastic or woodworking—variable speeds for more effective and economical metal sawing, filing or polishing. A dual range model combining both high and low speed control is a natural for experimental work on different materials.

IN ANY SHOP . . . AS $350

DoALL *Contour* machines are work horses of the metal shop, handling hundreds of conventional cutting jobs with accuracy and speed.

And, there are special production machines built to order for high output on your special applications.

No matter what your job, there is a DoALL Band Machine to handle it. Call your local DoALL Sales-Service Store or write:

The DoALL Company
254 N. Laurel Ave., Des Plaines, Ill.

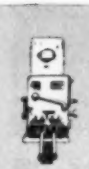
"Band Machine Headquarters"

ASK FOR CATALOGS

DoALL

DoALL Mobile demonstration units will bring a DoALL Band Machine right to your plant and demonstrate it on your work. There is no cost or obligation. Simply "Call DoALL" locally, or write to DoALL at Des Plaines, Ill.

8-13



SAW BLADE WELDERS

BAND FILERS

BENCH FILERS

TOOL GRINDERS

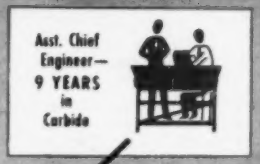
TOOLMAKER'S LATHES

TOOL STEEL

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

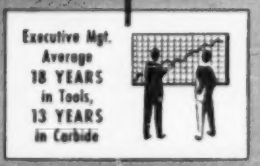
WESSON OFFERS YOU YEARS OF *Carbide Tool Making EXPERIENCE*

Every Key Man in the Wesson Organization is an Expert



It adds up to...

Specialists in carbide cutting tools. Over 28 years ago Wesson made the first carbide tipped tools successfully. Since that time Wesson has accumulated a wealth of "know-how" that can come only from a wide variety of experience and the intelligent application of the knowledge gained through that experience. Wesson's extensive facilities—engineering experience and manufacturing skill produce high production precision tools for America's leading industries.

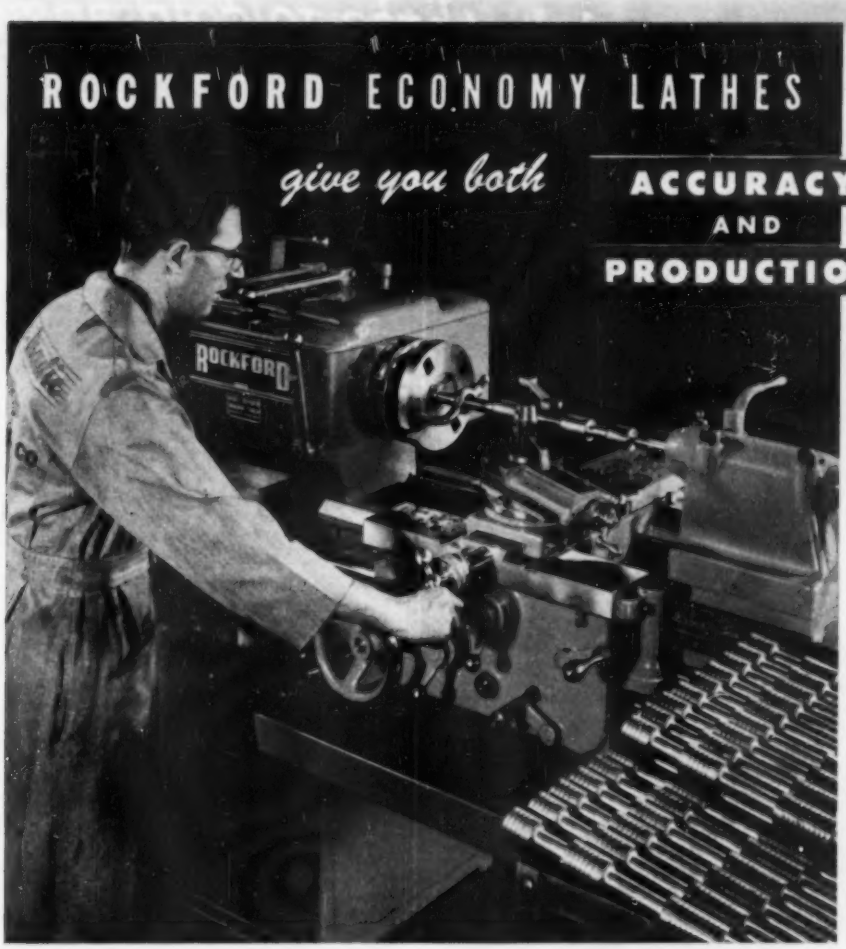


WESSON COMPANY *Affiliated with*
WESSON METAL CORPORATION
1220 Woodward Heights Blvd., Ferndale (Detroit 20), Mich.

WRITE TODAY
for information on Wessonmetal Carbide and Wesson Tools

ROCKFORD ECONOMY LATHES

give you both **ACCURACY AND PRODUCTION**



● Rockford Lathes are furnished with 2, 3, *or* 5 H.P. motors to give you power and speeds for heavy cuts or use of carbide tools.

A quick-change gear box provides carriage feeds from .004" to .060" and full range of threads from 4 to 56. Twelve spindle speeds are easily selected through convenient shift levers.

Tool room accuracy is a natural with the big, precision Timken Bearing Spindle. Heavily constructed tail stock is equipped with antifriction thrust bearings for ease of operation. Precision hobbed and shaved gears are provided in the headstock.

When you're buying Lathes, look for the *most* lathe, to give you *more* work. Ask a Rockford representative to give you the complete story on the *accuracy, production and economy* of Rockford Lathes.

MEDIUM-SIZED ECONOMY-PRICED **ROCKFORD ECONOMY LATHES—16" and 18"**

522

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS

here's Latrobe's three-fold answer to your die production problems...

QUALITY CONTROL

Throughout the entire manufacturing process, the quality of "DESEGATIZED" Hi Carbon-Hi Chromium Die steels is constantly controlled. From initial chemical analysis to final inspection of finished product—test after test, after test. That is why the user of these, the very finest die steels, is guaranteed

- ease of die fabrication
- minimum heat treat hazard
- extra toughness
- superior die performance.

WAREHOUSE DELIVERY

Latrobe maintains warehouse stocks of "DESEGATIZED" Hi Carbon-Hi Chromium die steels at these nine strategic locations:

- Chicago
- Cleveland
- Dayton
- Detroit
- Hartford
- Los Angeles
- Philadelphia
- Toledo
- Latrobe (mill)

Daily teletype connections—warehouse to mill and warehouse to warehouse—make each of these your local warehouse. Toll calls are accepted free of charge from many other adjacent points (consult the yellow pages of your telephone directory).

TECHNICAL SERVICE

Latrobe's metallurgical laboratory, completely modern, is staffed by technicians experienced in both the metallurgy and the application of die steels. These men can be of great assistance in the solution of production problems through

- Laboratory research into better steels
- Metallurgical analysis of die failures
- Disc inspection service
- Field service—selection of steels, proper equipment for working and heat treating assistance.

Production economy demands the best die performance! Select the best die steel for your next job—one of the "DESEGATIZED" Hi Carbon-Hi Chromium die steels!

SEND FOR THIS BOOKLET TODAY !

LATROBE STEEL COMPANY,
LATROBE, PA.

Please send me your folder regarding the "Selection and Use of DESEGATIZED High Carbon—High Chromium Die Steels".

NAME _____

POSITION _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

AM 1

LATROBE STEEL COMPANY

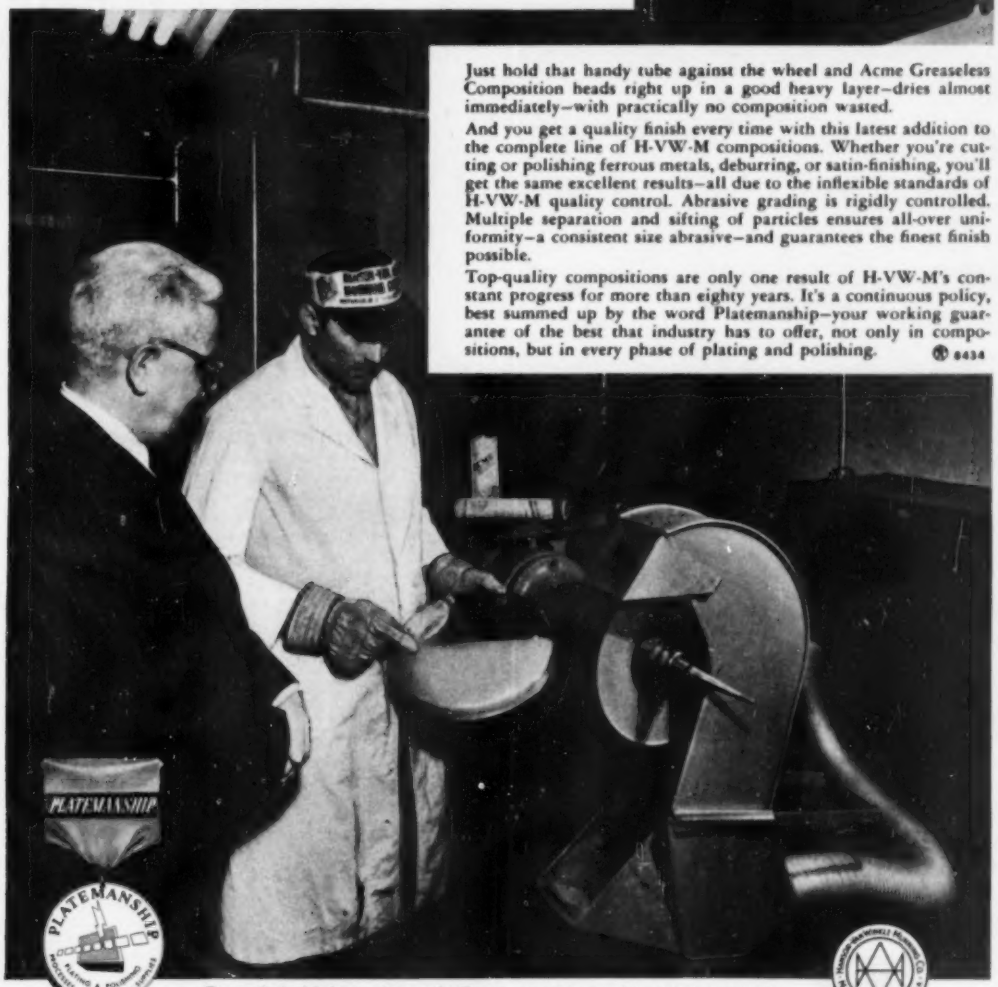
Formerly LATROBE ELECTRIC STEEL COMPANY

LATROBE, PENNSYLVANIA

Branch Office and Warehouses: BOSTON, BUFFALO, CHICAGO, CLEVELAND, DAYTON, DETROIT, HARTFORD, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, TOLEDO.

Sales Agents: DALLAS, DENVER, HOUSTON, MINNEAPOLIS, SALT LAKE CITY, SEATTLE, WICHITA.

seeing is believing with this new ACME Greaseless Composition



Just hold that handy tube against the wheel and Acme Greaseless Composition heads right up in a good heavy layer—dries almost immediately—with practically no composition wasted.

And you get a quality finish every time with this latest addition to the complete line of H-VW-M compositions. Whether you're cutting or polishing ferrous metals, deburring, or satin-finishing, you'll get the same excellent results—all due to the inflexible standards of H-VW-M quality control. Abrasive grading is rigidly controlled. Multiple separation and sifting of particles ensures all-over uniformity—a consistent size abrasive—and guarantees the finest finish possible.

Top-quality compositions are only one result of H-VW-M's constant progress for more than eighty years. It's a continuous policy, best summed up by the word Platemanship—your working guarantee of the best that industry has to offer, not only in compositions, but in every phase of plating and polishing. 8434

For technical information on buffing compositions ask for Bulletin C-100.

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO., MATAWAN, N. J.
PLANTS AT: MATAWAN, N. J. • ANDERSON, INDIANA
SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND
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INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

FLAT FORM TOOLS • COUNTER
HERRINGBONE GEAR HOBS • SHAPER CUTTERS • SPECIAL
MILLING CUTTERS • ROLLER AND
WORM GENERATING CUTTERS • TEE SL
SPLINE CUTTERS

PUNCH PRESSES PRODUCE MORE WHEN DRIVEN BY

STERLING SPEED-TROL!

That's one of the important reasons, states Mr. Robert McQuillan, why Somerset Tool Co. of Hillside, N. J., equips the Bjorling Four Slide Press they manufacture, with Speed-Trol. Speed-Trol permits selection of the maximum production speed required for each type and weight of metal processed... press speed can be accurately matched to any other sequence of operations... Speed-Trol is compact, easy to mount, provides readily accessible fingertip speed control.

STERLING SPEED-TROL GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

EQUIPMENT ADAPTATION TO: Sequence synchronization—operators' abilities—load variations due to differences in quantity, quality, weight, size, tension, hardness or shape of material to be processed, machined, conveyed, blended, mixed, etc.

PROCESS CONTROL OF: Temperature—viscosity—level—pressure—flow—etc.

TIME CONTROL OF: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.

With Speed-Trol you get the maximum in production, plant efficiency, quality and profit

OTHER STERLING ELECTRIC POWER DRIVES:
• STERLING SLO-SPEED (GEARED) MOTORS
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DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. A-100.

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile.
Offices and distributors in all principal cities.

FOR THOSE TOUCH *Special* JOBS

...DEPEND ON

National Tool Co.

● **Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.**

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

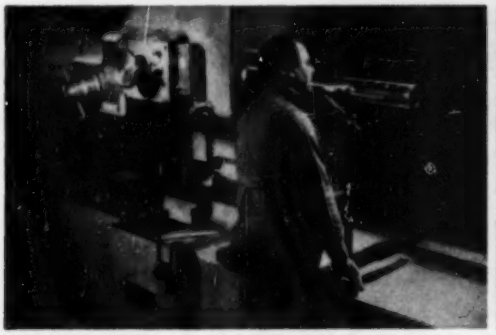
National Tool Co.
Cleveland 2, Ohio

52 YEARS OF SPECIALIZATION

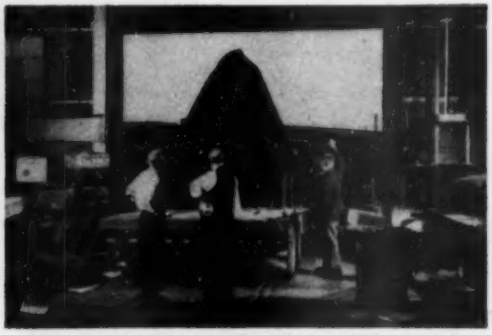
PAY DIVIDENDS in THE DEFENSE EFFORT

Our expanded plant is operating at peak capacity producing horizontal Boring machines, NOTHING ELSE.

In addition, many outside suppliers are helping us around the clock (using many a Lucas purchased from us in years past).



Because of half a century of specialisation Lucas men maintain high Lucas standards despite vastly increased output.



More shipments than ever, but, of course, defense priorities dictate who gets what. Perhaps this is the machine we originally scheduled for you.

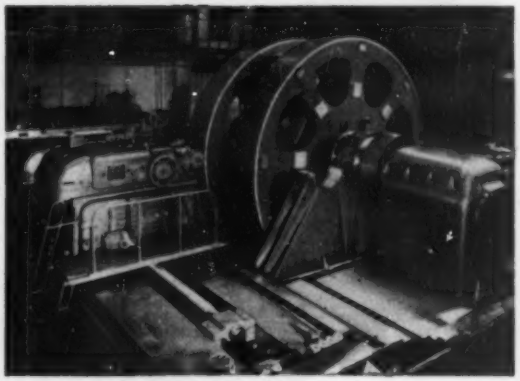
Precision Shaved Gears to Drive the.....

SS UNITED STATES

The largest, fastest, most luxurious ocean liner ever built in this country is an outstanding example of American know-how and initiative. Built by the Newport News Shipbuilding and Dry Dock Co., she carries the products of every state in the Union, including the finest mechanical equipment American industry can produce.

Among the important mechanical elements of the ship's propulsion machinery are the mammoth reduction gears made by Westinghouse Electric Corporation. To achieve the perfection of tooth surface required in these gears, they were finished on Red Ring Gear Shaving Machines.

These machines are built to shave gears of any size—from the smallest instrument gear to the largest marine gear.



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

Two smooth ideas for designers with vibration problems

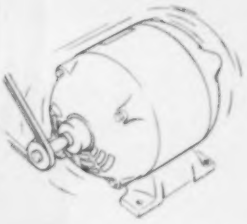
Vibration, shock, physical impact. How often does your design call for motors and controls that must operate under these conditions? The extra ability to stand up to slam-bang abuse . . . to teeth rattling blows is inherent in Life-Lines.

Consider the Life-Line motor. Heavy steel construction gives far greater shock resistance and protection to motor parts. Severe stresses of heavy loads, transmitted through motor frames and feet are easily withstood by Life-Lines. There is no distortion of laminations; no broken feet as in cast equipment. Further, steel adds this strength without adding bulkiness, actually reduces weight. You save space, weight; you gain strength, ruggedness.

Or look at the Life-Linestarter®. Vibration or accidental impact, in fact, jarring slamming blows do not cause false operation with resultant motor stoppage. That's because Life-Linestarters employ inverted clapper-type design. Contact opening *does not depend on gravity*. Positive kickout spring speeds operation. Result? No faulty operations from accidental blows . . . from jarring . . . from vibration.

Remember, too, Life-Lines advanced modern designs cost no more than conventional design. You get more with less servicing —equipment built to match the advancements in the equipment you design. A call to your local Westinghouse representative will bring you complete information; or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21702

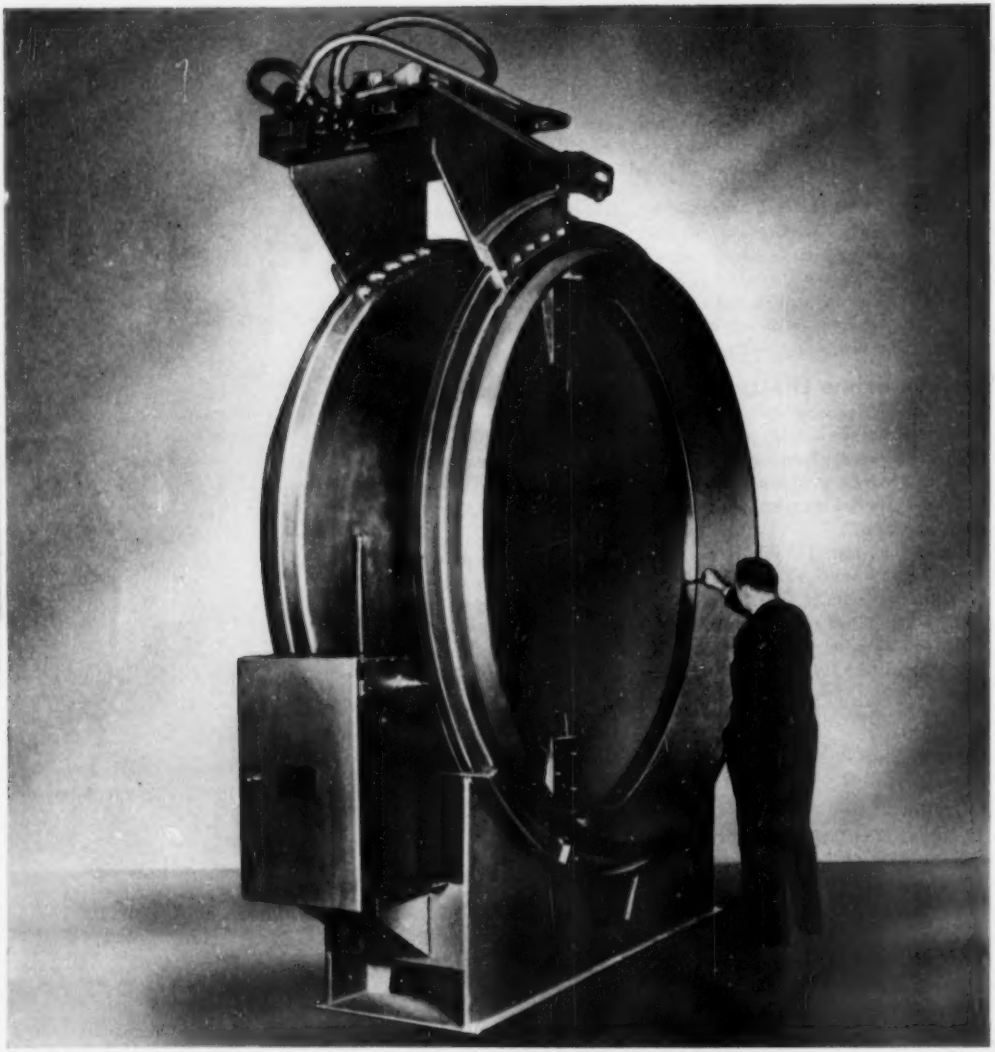
Life-Linestarters withstand jarring blows without faulty operation.



Steel stands up . . . reduces outages . . . saves costly replacement.

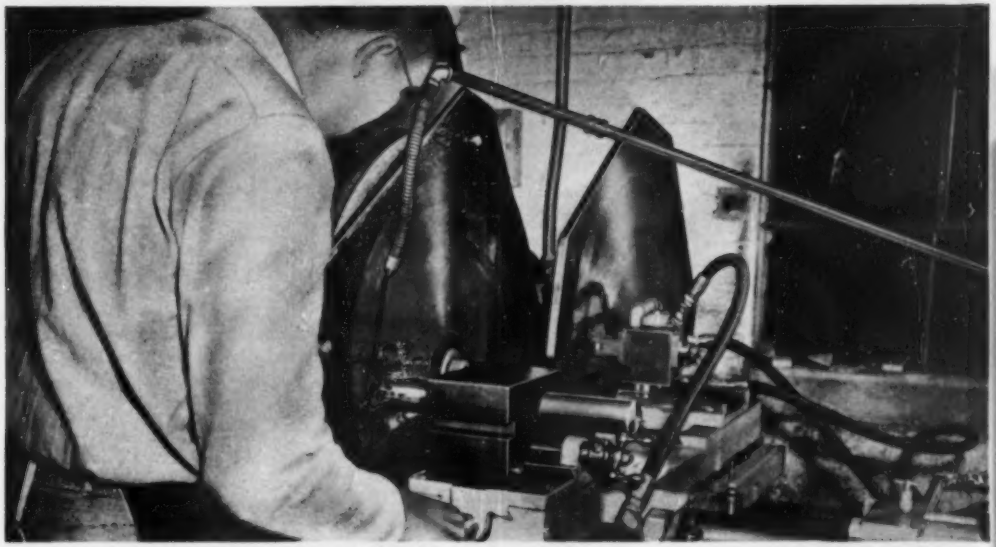
YOU CAN BE SURE...IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

CUTTING TIME ON .....YET FINISH IS



One of the steers seal valves made by Henry Pratt Company. Machining time of valves' hub seal plate was halved with a Sinclair Cutting Oil.

INCONEL HALVED IMPROVED!



Contour machining of a hub seal plate for a stressed seal butterfly valve.

The Dixon, Illinois, plant of the Henry Pratt Company makes stress seal valves from 30" up to 144" in diameter that seal tight at pressures up to 300 P.S.I.

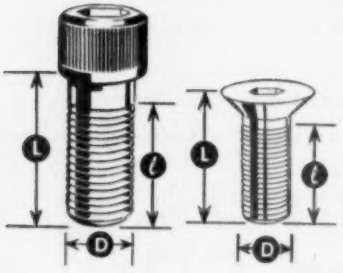
For the sealing band, Pratt uses INCONEL "X"®. This material poses rugged machining problems and preliminary machining efforts indicated excessive heating of the metal and tool wear resulting in a rough finish.

On the critical portion of the band, the hub seal plate, the company tried one of the Sinclair cutting oils with higher film strength, anti-weld qualities and cooling ability. Results? Time for turning this plate was *reduced from 9 to 4 hours*—and the *finish was greatly improved.* Also tool life was materially lengthened, meaning less downtime for the lathe.

This cutting oil, or one of the other Sinclair cutting oils and coolants, might ease *your* production headaches. It costs nothing to find out. Contact your Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR CUTTING OILS and COOLANTS FOR METAL WORKING

UNBRAKO® SOCKET SCREW DIVISION



WHY IS IT THAT 75% OF ALL SPECIAL SOCKET SCREWS ORDERED FROM SPS HAVE ODD THREAD LENGTHS?

75% of all screws classified by SPS as *specials* have odd thread lengths, probably because of widespread unfamiliarity with thread formulas.

In many cases, *standard* UNBRAKO Socket Screws can be substituted. They will save you time and money. They are available from the stocks of your local distributor. Ask him or write us for your copy of UNBRAKO *Standards*. STANDARD PRESSED STEEL Co., Jenkintown 1, Pennsylvania.

What Are the Standard Thread Lengths?

The authority for the thread formulas used by SPS and other threaded fastener manufacturers is Handbook H28, Screw Thread Standards for Federal Services, National Bureau of Standards. It reads:

The length of the screw thread is measured from the extreme point to the last usable thread and shall be as follows:

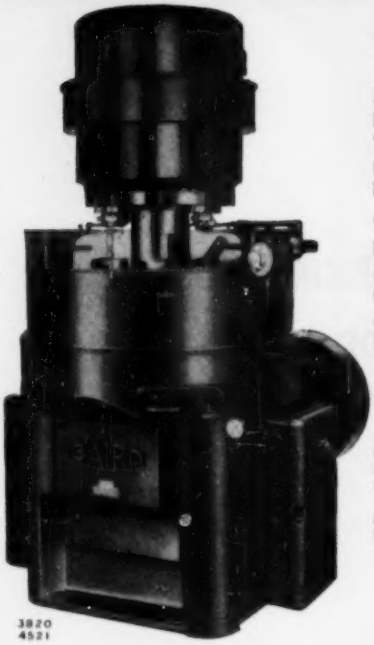
For American National Coarse Thread Series	ℓ = 2D + ½" (where this length of thread would be greater than half the screw length). ℓ = ½L (where this length of thread would be greater than 2D + ½").
For American National Fine Thread Series	ℓ = 1½D + ½" (where this length of thread would be greater than three-eighths the screw length). ℓ = ⅜L (where this length of thread would be greater than 1½D + ½")

Screws too short to allow application of these formulas shall be threaded as close to the head as practicable.

SPS
JENKINTOWN PENNSYLVANIA

Knurled Head Cap Screw | Self-Locking Set Screw | Flat Head Cap Screw | Shoulder Screw | Dowel Pin

ASK BAIRD ABOUT IT!



It's AUTOMATIC . . *it's* FAST . . *it's* ACCURATE

FEATURES: Turret (work spindle carrier) turns continuously, grip of holding fixtures automatically releasing for operator to unload and load. Tools move horizontally for facing operations . . . other tools vertically for turning operations. Machine is designed for dry or wet cutting of light jobs, boring piston ends, facing, turning bands, ogives, etc.

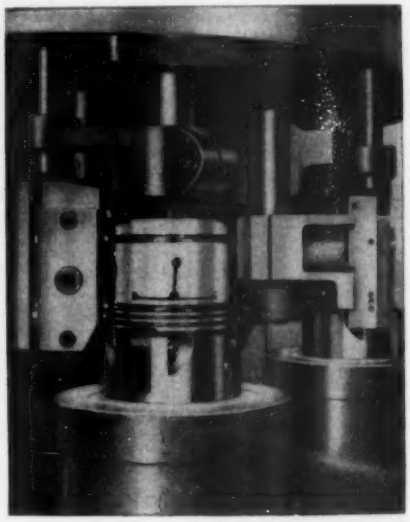
The turret is driven through worm and gears . . . spindles mounted in roller bearing and driven by helical gears. Changes in all speeds are easy . . . inexpensive. Convenient spindle control station at left, control at right for turret and tool arms . . . arranged to prevent feed of tools to work unless spindles are revolving. Both turret and spindles are driven by V belts. Electrical equipment is enclosed, wiring concealed.

Left: Front view, showing splash guards for wet cutting.

Right: A close-up view of typical tooling set-up.

BAIRD 4-SPINDLE VERTICAL CONTINUOUS LATHE

The machine mounts four 5" chucks on a spindle circle of 18". Spindle speeds 240–860 r.p.m. Longitudinal tool stroke 3¼" . . . cross tool stroke 2¾". Feeds .001" to .030" per revolution. Spindle drive 3 to 5 H.P. with push button control; machine drive 1 H.P. Spindle carrier cycle time 12–38 seconds. Production time 3–9 seconds per piece. Cutting time 9–28.5 seconds. Now's the time to "ask Baird about it."



HORIZONTAL AND VERTICAL TOOLING

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

HIGHLIGHT *of drill chuck history*

The tightest, truest tool-holding grip ever devised is at your service in the Jacobs Ball Bearing Super Chuck. Its precision ball bearing construction, assuring tremendous strength and friction-free operation, combine to give you the world's finest drill chuck. No wonder it's the overwhelming choice for heavy duty drilling.

Jacobs Chucks are stocked and sold by your Industrial Supply Distributor.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

Another World Leader. The same special steel alloys, rugged construction and precision craftsmanship combine to make the Jacobs Plain Bearing Chuck unequalled for light and medium duty drilling. It is the world's most widely used chuck.

IF IT'S A

JACOBS

IT HOLDS

Keep Your ‹ › on the OLIVER Line
— Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers with "pack to" sizing equal work give betterment, cuts more accurately, more perfect holes, more efficiency, longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½.

No. 510 Bar Drills ¼ to 3". 2-3-4 flute

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models

Bench Model 5-1 — illustrated — Single Speed Die Maker for use on Tool Steel up to 1" Thick

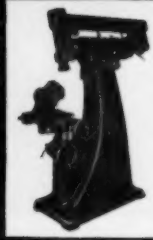
Heavy Duty Model — illustrated — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" dia., slab mills, slitting saws, all types of cutters and reamers.

2 Models: Heavy Duty, Illustrated; and Standard



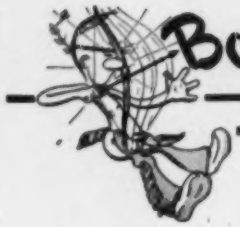
OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high — from 0° to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high-speed tools. Offers increased production, lower tool costs and savings in man hours. Extremely fine finish assured.

Complete Information

OLIVER INSTRUMENT CO.

1613 E. MAUMEE ADRIAN, MICHIGAN



Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Cost Estimating

I am interested in the problem of estimating new work for a large machine shop engaged in producing light machinery in lots of 500 to 4000 units. Specifically, I am interested in estimating unit time per machine for future production, based on the unit time of the first few machines produced.

I have some information in the form of learning curves, but wish to enlarge this and further investigate this particular aspect of estimating. Could you advise me of any authoritative publication dealing with this problem?

R A Hill
Olive, Calif.

We would suggest different approach to this problem. Rather than working from the first-piece time and learning curves to predict performance time on future machines, why not establish values based on standard times to give you the time you expect to attain when operators reach 100% efficiency? Then apply the learning curves to determine how long it will take the operators to reach standard performance.

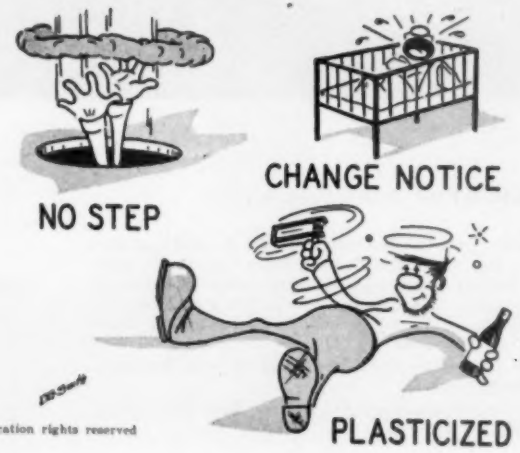
We would suggest your reading Machine Shop Estimating, ***by Nordhoff, published by McGraw-Hill Book Co. It contains a great deal of useful information and has been very popular ever since it was published, a few years ago.***—Ed.

Congratulations

Congratulations to Robert Galloway (*AM*—June 9 '52 p152). I hereby appoint him an honorary member of the Ancient Order of the Crib Window. This is the first time anyone has brought the matter into the open and shown that toolcrib attendants are not just a bunch of bums who are no good for anything else. Too many plants look on the toolcrib as a good spot for the mental cripples they don't want to fire, instead of realizing that efficient crib service is

GRINETICS

BY D. G. SMITH



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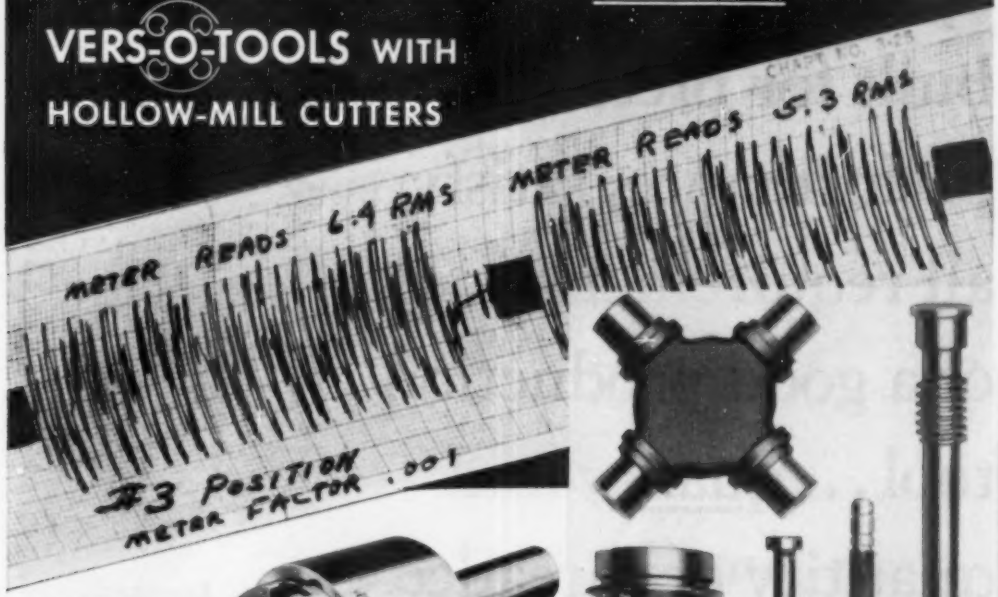
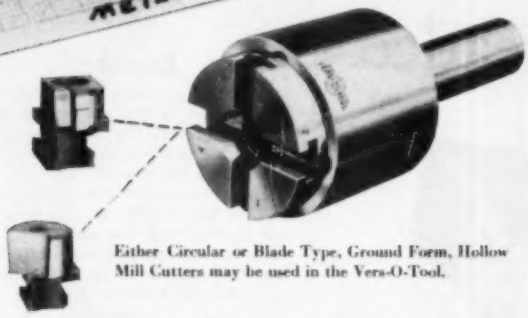
FOR FINE FINISH . . . FASTER . . . USE VERS-O-TOOLS WITH HOLLOW-MILL CUTTERS





Either Circular or Blade Type, Ground Form, Hollow Mill Cutters may be used in the Vers-O-Tool.

If you are producing parts such as those pictured in the panel at the right, it will pay you to investigate the Vers-O-Tool method of hollow milling these jobs. You'll save time, you'll save additional grinding operations—and you'll save on tooling costs.

Hollow milling with these multiple cutter heads is three times faster than with single-point tools, and in some cases diameters are held to 5.5 micro-inch finish.

Namco circular milling cutters, for end forming, end turning, knurling, or burnishing, are interchangeable, die size for die size, with circular threading chasers for use in the same Vers-O-Tool heads. For complete details ask for Catalog D-51.

The NATIONAL ACME CO.

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Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Bay State Taps, built for precision performance, satisfy all requirements of a good production tool . . . quality and quantity of threaded product . . . . . .

On nearby shelves of industrial supply distributors.

BAY STATE TAP & DIE CO.
MANSFIELD, MASS.

one of the most important keys to efficient production. If they would give us well-lighted, well-arranged toolcribs, conveniently located, they could save themselves thousands of dollars.

I know what I am talking about, because I served a six-week stretch in the toolcrib after I broke my arm and, handicapped as I was, I was still able to give the guys better service, because I knew what it was all about. When someone came and asked for "that trick gadget we made up for that special milling job," I knew what he was talking about, and when he brought back a cutter and said it was dull, I didn't give him an argument that "it was alright last week when the other guy used it."

I don't like to brag, but after I got back to the machine, the other guys made such a fuss that they had to fire the stumblebum in charge of the crib and give the job to a real machinist who was getting a bit too old to stand the gaff and had been looking for an easier job anyhow.

Alvin C Branthorn
Cincinnati, Ohio.

Balance

We have received a number of inquiries as to the address of the manufacturer of the balancing machine used by Monarch Machine Tool Company (*AM*-May 12 '52 p173).

The name was incorrectly supplied as Lion Mfg. Co. We wish to inform our readers that this equipment is made by the International Research and Development Corp, 908 W 3rd St, Columbus 8, Ohio.—*Ed.*

A Matter Of Pride

Your little story in "Talking Shop" (*AM*—June 9 '52 p175) may be true, but it is the sort of thing that gives trade unions a black eye. As a union machinist myself, I know that you can be fired for doing inaccurate work, especially if it is habitual.

One of the purposes of a trade union is to protect the worker against unscrupulous and avaricious employers, but an equally important function is to protect and preserve the

tool steel is the apple of our eye!

We're especially proud of our tool steels . . . because users rate them tops in the field. In fact, users think so highly of them, they've made Crucible the country's number one producer of these fine steels.

We like this enviable position. Thus, we make sure our research and development keeps step with industry's need for new, improved tool steels. You, too, can profit from our long experience by taking advantage of our metallurgical service. You are assured of prompt delivery of your requirements from our fully-stocked warehouses, strategically-located throughout the country.

SEND TODAY for the unique Crucible Tool Steel Selector—a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels
Peerless Hot Work Steels
Halcomb 218
Chro-Mow®
Sanderson Carbon Tool Steels
Ketos®
AirKool Die Steel
Airdi® 150
Nu-Die V Die Casting Steel
CSM 2 Mold Steel
La Belle® Silicon #2
Aisa Paou

SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

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Company_____ Title_____

Address_____ City_____ State_____

9" diameter, 3-colors

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

HEAVIER CUTS IN HARDER MATERIALS AT HIGHER SPEEDS

Get More Production with GORHAM "M-40-B" Tool Bits!

Get more out of your machine tools . . . raise your production curve . . . with Gorham "M-40-B" turning tools! Use "M-40-B" wherever the application of a Super High Speed Steel is indicated, as in machining heat treated alloy steels with large amounts of stock removal at high surface speeds.

"M-40-B" is a Super Moly grade with performance characteristics comparable to those of super tungsten high speed steel. It has extremely high red hardness, high Rockwell hardness, and offers maximum toughness and abrasion resistance. You can take heavy roughing cuts with it at high surface speeds and feeds . . . use it for high speed finish cuts as well.

"M-40-B" comes in square tool bits, 11 stock sizes, and in 23 stock sizes of rectangular turning tools. Bits and turning tools are accurately ground, uniformly hardened, ready to sharpen. Special sizes and shapes to your order. Illustrated with prices are three popular size "M-40-B" tool bits. See your distributor, or send direct for a trial order.

"M-40-B" is one of three cutting tool materials developed by Gorham. Others are Gorham "Standard", for the commercial field, and "Gormet", for turning soft or abrasive stock. They're completely described, with size and price lists, in a new free bulletin. Send for your copy today.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

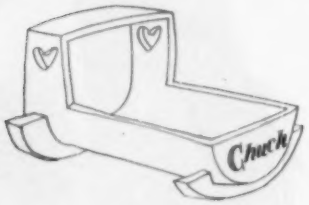
14408 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

skills of the trade. Otherwise, why would we, not the employers, insist that a lad serve a full apprenticeship before he can rate the title and pay of journeyman. We want to be sure that he will be able to perform any task in a capable and workmanlike manner, so as not to bring disgrace on an honorable trade. We still preserve the traditions of the ancient guilds and take pride in workmanship.

I am sending this letter air mail, as I would like you to publish it as soon as you possibly can.

D A A McFarlan
Glasgow, Scotland



Chuck It

Here's a good one I came across in one of the magazines. It might be amusing to some of the old timers. It reads: "Drop Proofing a Lathe Chuck—Here's a way to remove a heavy lathe chuck without dropping it on your fingers or the ways. Loosen the chuck a bit and hold it while you pull the V-belt backwards. When the spindle nose unscrews itself, you've the chuck in your hand."

I've been a stickler for safe removal of heavy lathe chucks and often advised that lathes be equipped with suitable swinging arms to facilitate the operation, but the idea of waking up to the fact that I had a heavy chuck in my hand would lead me to wonder what I would do with it! Perchance one of these days we'll come upon a suitable metal of light weight and sufficient strength to make the handling of a chuck a pleasure instead of a burden. One of the most dangerous ways of putting a heavy chuck on a spindle is to slip the chuck on the spindle while it is turning slowly, without first making certain that the thread is properly engaged. I had to turn my head when looking at a man do this so as not to be in on the disaster that was likely to follow. A hardwood cradle is about the safest and most convenient contrivance for handling the putting on and taking off of heavy chucks.

Jack Everett
San Francisco, Calif.

ease and economy

...with Super Service accuracy

● Photo—Courtesy Aerojet—Division of The General Tire & Rubber Co.

Working on rocket motors at Aerojet—Division of The General Tire & Rubber Company, this versatile 4' 9" column Cincinnati Bickford Super Service Radial is economically drilling and tapping in type 347 stainless steel.

Class 3 fit is required on the tapping operations of these ½" x 20" and 7/16" x 24" holes.

In this unusual installation a 12-foot pit permits processing of large work in vertical position, while another piece is set up on large V-block fixtures on plain box table.

The centralized controls clear view Bickford Head, and wide selection of speeds and feeds all bring ease and economy on this job.

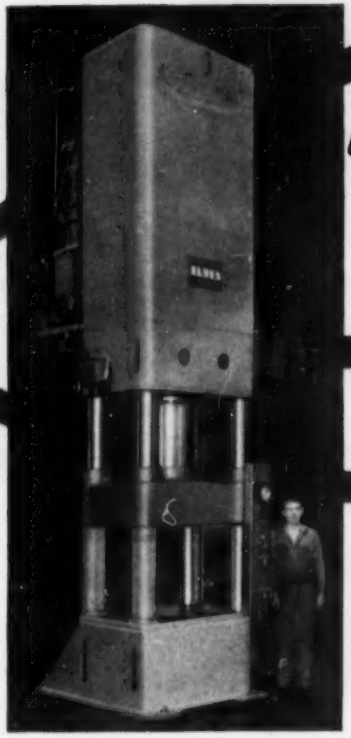
Write for Booklet R-21-B.

CINCINNATI BICKFORD

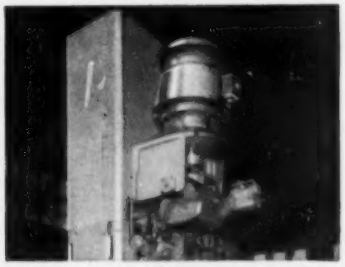
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.



Elmes Pipeless Press designed for use in hot or cold nosing of artillery projectiles. Note complete absence of conventional high-pressure piping in main hydraulic circuit.



Rear view of upper section of above press, showing Pipeless Pumping Unit. The only pipes on entire press are pilot lines, pressure gauge line, and drain lines. Of these, only the pressure gauge line carries high-pressure fluid.

Munitions Manufacturer Scores "DIRECT HIT" ON MAINTENANCE COSTS!

...with *Elmes* PIPELESS Hydraulic Presses

Shown here is one of a group of Elmes Pipeless Hydraulic Presses recently installed in the plant of a large munitions manufacturer. These revolutionary new-type presses will be used in the production of artillery projectiles.

High production and virtual elimination of downtime are assured by the Elmes Pipeless design which *puts an end to high-pressure piping troubles.*

The main hydraulic circuit in this new-type press has *no piping.* All high-pressure fluid is conducted through short, direct passages drilled in the structural parts. There are no high-pressure screwed joints to loosen, no oil dripping from loosened pipe or fittings, no welded joints to break.

Now you can get the superior advantages of Elmes hydraulic power—speed, accuracy, instant response, smooth operation—*plus* matchless economies of the Pipeless principle, *all at no premium.*

Any type of Elmes Hydraulic Metal-Working Press can be supplied with the new Pipeless construction. Get the facts on this outstanding Elmes development now!

WRITE FOR PIPELESS PRESS BULLETIN 1011

Fully illustrates and describes in detail the production-increasing, cost-reducing features of these revolutionary new-type metal-working presses.

American Steel Foundries

SPOT NEWS of Metalworking

- **Solar Aircraft's process for making stage dies for sheet metal stamping** will be used under license by Rolls-Royce Ltd., Derby, England. The process is particularly applicable to the forming of stainless steels used in aircraft engines. It cuts cost of expensive tooling, speeds output, eliminates tearing, breaking and thinning in forming sheet metal shapes.

- **Russia has formed a new agency named "Maschino-Export"** for export of Soviet-built machinery for electric power, mining, hoisting, transport, metals, chemical, light and food industries. This action indicates: (1) Mounting flow of Soviet capital goods to east Europe and China; and (2) expansion of capital goods shipments to under-developed areas of southeast Asia.

- **Contracts for procurement off-shore of more than $550 million of military items** had been signed by the armed services during 1952 up to midyear.

- **A machine for cold-shaping of metal plates and profiles** is being produced by Fokker Aircraft Factories of Amsterdam. Plates are shaped by upsetting or stretching. Machine has set of split metal heads, one above the other, the lower moving up and down. When upsetting heads are mounted, plate undergoes contracting movement and becomes thicker there. Use of stretching heads has opposite effect. By successive operations and by moving up the work-piece, required profiling is secured. Machine is driven by electromotor at rate of 33 strokes per min.

An automatic gage for attachment to various types of machine tools has been developed in France. It uses compressed air at sonic velocity in a balanced circuit, is said to be capable of detecting dimensional variations of 1/10 micron. Any such variation deflects a diaphragm to open or close electric circuits and readjust the machine to bring the work back within tolerance.

- **Low-alloy steel tubes covered with skin of model cladding** are being used for extensible radio and radar masts for snorkel submarines. Metal requirements thus are reduced to 465 tons of which 50 tons are machined away, compared with 10,920 tons of scrap produced by former process of forging and piercing from solid stainless steel billets. The new process takes 11,320 tons of steel to make about 400 masts with finished weight of 400 tons.

- **Government is concerned over lack of progress on construction of giant presses** for aircraft production. One manufacturer with a contract for several big presses has fallen so far behind, defense officials say, that the government may have to step in to get work started.

- **Mortar shell production line in Cleveland,** affected by the steel strike, has gone back onto a full schedule as result of steel tonnage shipped from Texas. Government agencies are hard at work locating steel for defense contractors in present emergency.

- **Recommendations of a project or projects** to determine what should be done to keep the machine-tool industry healthy as a national defense asset are to be made to the National Security Resources Board by Booz, Allen & Hamilton, management engineers, within the next 60 days. Representatives of this firm, retained by NSRB, are now visiting machine-tool builders to get their views at first hand of their future problems.

- **One-third the space in the new General Motors dual-purpose plant** at Arlington, Tex., is to be devoted to fabricating and assembling a new Grumman plane and two-thirds to assembly of Buicks, Oldsmobiles and Pontiacs. Plane output can be increased several times by redistribution of floor space between plane and auto assemblies.

- **Proposed limitation order on use of JIC and other electrical standards for machine tools** not conforming to NMTBA standards will not be issued by NPA. NPA order minimizing protective finish requirements on machine tools is to be revoked.

The Spindle You Want

In This Complete Catalog

For speed, precision, endurance, your best choice is an Ex-Cell-O Grinding Spindle. You'll find one to suit your needs in the big, 80-page Ex-Cell-O Catalog 25962, supplied with price list on request.

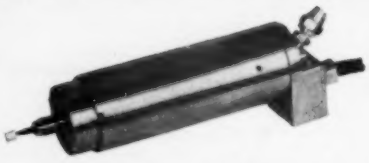
● Leading grinder manufacturers install Ex-Cell-O Precision Spindles as original equipment. You can improve the performance of your grinders with Ex-Cell-O Precision Spindles. They are rigid and smooth-running, permit heavy cuts without chatter, require no lubrication or adjustment. All are fitted with precision ball bearings manufactured by Ex-Cell-O.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

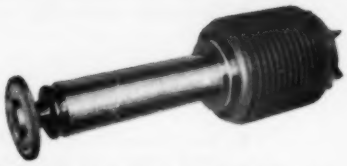
Single-body, belt-driven internal grinding spindle.

Double-body, belt-driven internal grinding spindle.

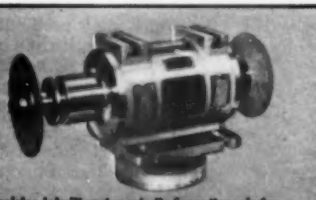


85,000 rpm high frequency inbuilt motor spindle.

25,000 rpm high frequency inbuilt motor spindle.

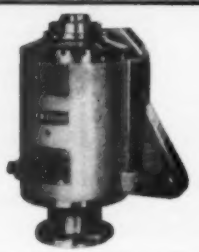


Totally enclosed inbuilt motor surface grinder spindle.



Precision inbuilt motor spindle for cutter grinder.

Vertical precision spindle with inbuilt motor.



XLO
EX-CELL-O for PRECISION

Washington

Good business for the rest of 1952 is sure, government economists predict. That's what you'd expect them to say in an election year. But there's more to it than that.

• • •

Big uncertainties are over politics, steel, more labor strife. But they aren't enough to cloud the rosy outlook to any great extent.

On the bright side are: (1) the continued high level of industrial expansion, which won't be tapering off until next year—if then; (2) defense production, which will continue to increase this year, regardless of what Congress does to the military budget before or after the November election; (3) definite firming up of some civilian production, like housing, textiles, automobiles.

• • •

Industry's plant expansion plans flabbergast Washington's economists. With the bulk of major expansion for defense—munitions, steel, aluminum—under way, Washington had expected a lull. Instead, industrial equipment and components, even some consumer goods, are expanding to catch up.

• • •

That's why five-year amortization is ending. Controls officials figure most of the defense and supporting plant yet to be started will get built even without this incentive. So the tax aid program will be brought to a slow halt.

So don't count on fast amortization until you check with Washington. Contact your regular claimant agency in NPA or elsewhere. They'll tell you if you can count on tax relief for the specific type of expansion you want.

• • •

Military spending will stay high, regardless of who wins the election. Economy talk now is just that. Arms output is just beginning to roll. A serious cut in defense budget would stall production. We can't afford that.

• • •

Impact of the steel strike can't be measured yet. Defense production is hurt a little, consumer goods more. Defense will get first grab when steel is in full production again. But defense and civilians don't compete very much for steel: generally, they use different forms.

And downswing in some consumer goods helps. Production of some appliance lines, big steel users, was cut anyhow because of factory inventories. Auto makers will be hurt, though.

• • •

What to do about strikes? The steel crisis shapes up as just a starter, with trouble in coal, copper probably ahead. Congress hasn't faced up to the problem of shutdowns in vital industries yet, won't do so this year if it can squirm out of it.

• • •

Plane production is set to roll. Air Force figures that base is broadened enough, schedules are set, and specs are firm. So, this summer production should pick up fast. The only limiting factor now is money. If Congress lifts the spending lid of $46 billion, the Air Force will spend about $20 billion next year. If not, a cut of $2.3 billion will have to be made in aircraft procurement.

• • •

But manufacturers have a lot of catching up to do. Since Korea the Air Force has lost over 1000 planes in combat, plus a couple of hundred more in non-combat accidents. The Navy has lost about 360 more in combat, plus about 450 operationally. Put total losses around 2000 combat-type planes. During the same period, manufacturers have turned out 9000 planes, about half of which have been combat types.

• • •

We've sent about 2,300 combat planes to NATO and other allies. So, our net gain is probably a little more than 1000 combat planes in two years. We need six or seven times that number to fill our requirements.

• • •

Then, too, we have mostly old planes. About 40% of the Navy's 10,000 planes are modern. Only 40 of the Air Force's 90 wings on hand are equipped with modern planes. Only 70 of the wings are considered at all serviceable.

• • •

Big bottleneck is still jet engines. Five major engine producers are short 50 to 100 pieces of tooling vital to volume production. That has resulted in about 12% slippage of production. Still in tight supply are the following jet engines: Allison's J-35; General Electric's J-47; Pratt & Whitney's J-48; and the famed J-65 British Sapphire being turned out by Curtiss Wright.

Engine shortage has stalled output of planes like the Sabrejet and the B-47. Some came off the lines and waited on ramps for engines. Total probably never exceeded 100 but is now dwindling. Douglas had the same trouble with the Navy's F3D jet night fighter.

• • •

Draft eligibles can now pick their service. Pentagon relaxed rules that forbade men from volunteering for Navy, Marines or Air Force after having pre-induction exams. Up to time a man gets his final call, he can now volunteer. But enlistments for other than Army service are still four years. Army volunteers can enlist for two years minimum.

THE right TOOL

Every mechanic knows the importance of having the right tool for the job.

In a hand operation, a good man can make up for deficiencies in his equipment by his personal skill and know-how. A machine does not have this skill. The Tool must be right. The men who design and build the tools must have the know-how.

For over thirty years the Micromatic organization has been developing, building, and servicing honing tools. Every Micromatic tool is engineered to give the greatest possible precision and productive life.

We have the right tool for your job. Buy from the organization with a complete line of honing tools for every type and size of cylindrical surface.

Write for the complete story of Microhoning Tools in "Cross Hatch."

Micromatic MICROHONING TOOLS

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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MICRO-MOLD MFG. DIV.
321 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES: Overgard Machine Tool Company, 838 Symes Building, Denver 2, Colorado
Hallidie Machinery Co., 2736 First Ave., South; Seattle, Wash. . REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

Detroit

The steel strike will react further in automobile production later on, regardless of present reactions. Several lines have already shut down. Others are on shortened schedules.

Then, in the weeks ahead, will come the delayed reactions, because automobile companies have generally moved to run out their supply and auxiliary lines. These will have to be rebuilt (once they begin to get mill shipments again) before final assembly output can resume.

• • •

Effect of these schedule losses on new model introductions is unanswered as yet. Considerably before the end of any model run, a manufacturer will have issued purchase orders for requirements of the complete run.

Many of those requirements are undoubtedly now produced, even though releases have been held up on them. To cut the model run short, therefore, would impose large penalty charges on the producers. It might be cheaper for them to run through their original model projections.

• • •

On the other hand, output has not been moving anywhere near capacity levels, due to government quotas. The companies may decide to get back their lost production by higher schedules, once their steel problems clear, and thus close out the model runs at the same time on the calendar originally contemplated.

Some producers are worried for farther along than that. They are looking at the stoppage of shipments of iron ore, wondering if this may result in a steel shortage toward the end of next winter. A few purchasers consider this a real possibility.

While steel supply was stopped, Fisher Body Div announced a new program for buying of steel. Henceforth it will be done at plant level, at each of the fabricating plants—Detroit, Flint, Pontiac, Grand Rapids, Cleveland, Hamilton, Pittsburgh. Control and policy making will continue in Detroit.

• • •

Meanwhile, output maintained itself fairly well through June. Volume for the month held around the 135,000-a-week mark, cars and trucks, US and Canada included.

The first July week, impeded by steel shortages and the Independence Day holiday, was to see that level dip materially, down around 100,000. Thereafter the figures were quite unpredictable, the factors being as problemsome and intermixed as they are.

• • •

This enforced softening came about the time Detroit was beginning to face a definite labor shortage again. In retrospect, it is evident that the "unemployment crisis" of last winter was not well founded. Men were idle, true enough, but many had left town or otherwise disappeared from the labor market.

That is richly proved by the evidence: Employment is still below its midsummer 1951 peaks, but the thousands supposedly idled as payrolls dropped from those levels aren't around to bring them back. Personnel managers are hard put to get men.

• • •

Capital goods makers supplying the auto plants are facing enlarged backlogs. Many machine tool, tool and die, and equipment shops experienced good-sized bulges in their order banks during June. Why so? Mainly because Washington has eased up, has permitted acceptance of unrated orders and others for Europe.

One medium-size machine-tool maker said his backlog doubled in a 10-day stretch of June, primarily with unrated orders, secondarily with additional defense work.

Beyond the present releases, the shops are looking for fairly early action on a large Chevrolet engine program. Speaking of Chevrolet brings Ford to mind; it does not look now as though the new Ford V-8 will be tooled in time for 1953. So the indication is that these two arch-rivals will each go into the 1954 model market with new powerplants.

• • •

A long range public relations approach to engineering problems was undertaken by General Motors with a 13-day engineering conference in Detroit during the latter part of June. Guests were 19 college educators from all over the country.

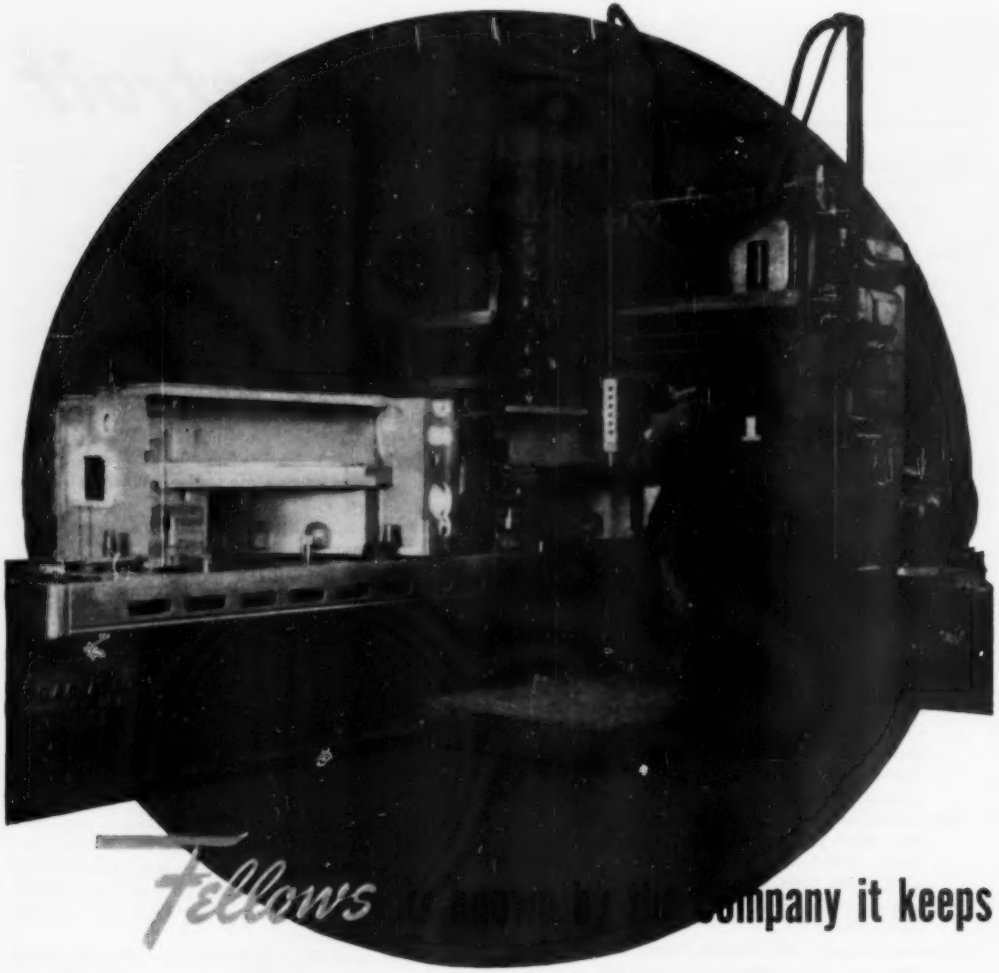
They reviewed, discussed, and saw GM engineering policy and practice, were given chances to criticise it, were told what General Motors wants in technical training, and presumably went away well disposed toward General Motors and well disposed toward the idea of recommending to their best students that they go to work for the largest automobile producers.

• • •

Carburetor design, moving forward by leaps and bounds everywhere, has had another upward push with a new Chrysler 2-barreled type, smaller, lower, weighing half as much as the one it replaces in the DeSoto V-8 engine. It consists largely of aluminum die castings.

• • •

General Motors is expanding its Defiance (Ohio) foundry by 50%, adding 40,000 sq ft to meet increased requirements, mainly for diesel engine blocks and castings for Oldsmobile powerplants.



Fellows [illegible] company it keeps

The Fellows Gear Shaper Co., Springfield, Vt. is universally known for building top quality products . . . using advanced methods and the most modern equipment. Fellows' modern machinery includes this new GRAY 48" x 48" x 16' Milling Machine, which is ideally suited to their fast, high production requirements. GRAY's modern speeds are demonstrating in hundreds of shops, that jobs don't grow old on a GRAY!

GRAY self-contained Unit Heads permit high horsepower cuts with speeds from 10 to 1000 instantly available by the flick of a lever.
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planers • milling planers
planer type milling machines
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Machine Tools

A list of critical machine tools which are to be reserved exclusively for defense and defense-related customers was attached at the last minute to the amendment to NPA's Order M-41 permitting shipment of unrated orders.

This list has been compiled by NPA's Metalworking Equipment Division on the basis of a review of the order boards of all machine-tool companies.

The time it took to put together the list was responsible for the delay in issuing the amendment. The list includes: vertical turret lathes, horizontal and vertical boring mills, certain sizes of automatic screw machines, certain types of grinding machines, certain sizes of turret lathes and milling machines, tracer-controlled lathes and T-lathes.

• • •

Inclusion of the critical list caught by surprise a number of government agency people when they attended the Washington meeting of the Machine Tool Industry Advisory Committee on June 17.

These people had endorsed the amendment without the list four days previously.

The explosive political situation, more than anything else, was responsible for the decision of NPA's high command to append a critical list to the amendment.

Critical types of machines are backed up on order boards for 12-24 months. Armed services are pressing for deliveries.

Permission to builders of such machines to ship to unrated customers could easily kick up quite a fuss in Congress. So Washington's reasoning runs.

The restrictions also tend to protect builders from big peacetime customers who otherwise would do their best to get deliveries of machines for new-model production, come what may.

• • •

New amendment is so hedged with restrictions that a builder cannot be absolutely sure up to the actual day of shipment whether his unrated order is going to be filled on time.

Such shipments must not interfere with deliveries of rated orders on required dates.

This is not to say that a builder may not put an unrated order into process and deliver it prior to delivery of a rated order provided that the rated order is delivered on time.

But the fact is that any unrated machine may be turned over to a rated customer right through the freeze period.

• • •

Government officials acknowledge that the M-41 amendment is a compromise at best. It goes only half-way in meeting the wishes of the industry, which would like to go back to the rated-and-unrated formula which prevailed before M-41 was issued in February 1951.

Washington wanted to aid "depressed segments of the industry" which in some cases, possess backlogs mainly comprised of non-defense orders.

It's a fact too that almost 200 builders, or two-thirds of the industry, had filed "hardship" applications with NPA for authorization to ship machines to unrated customers.

• • •

Builders say that the new amendment will result in inequities. Builders with big backlogs will be unable to supply any peacetime customers, here or abroad. They will be in a position of losing to others the kind of business which is most desirable from a long-term view.

There is some feeling that issuance of a critical list if unnecessary. The restrictions in the M-41 amendment which give unquestioned preference to rated orders over unrated accomplish the same result.

Certain observers point out that builders of critical tools could ship at least a small percentage of their output to unrated customers without delaying the defense program. Reason is that required delivery dates on many defense orders are unrealistic. Machines arrive weeks and even months before they are used.

• • •

Air Force and Navy Bureau of Ships and Ordnance estimate that they will place orders for about 35,000 machine tools from now until the end of 1953. Total is roughly put at $500 million, but that is a wild guess. Army still is to be heard from.

Truth is that no one knows—armed services or any one else—what machine-tool needs for defense will be. Armed services are said to have funds now with which to buy 35,000 machines if they choose to do so.

But they won't do anything much until they find out what funds they will get in fiscal '53.

If they don't receive as much as they think they should have have for weapons, they will spend part of their machine-tool money for more weapons.

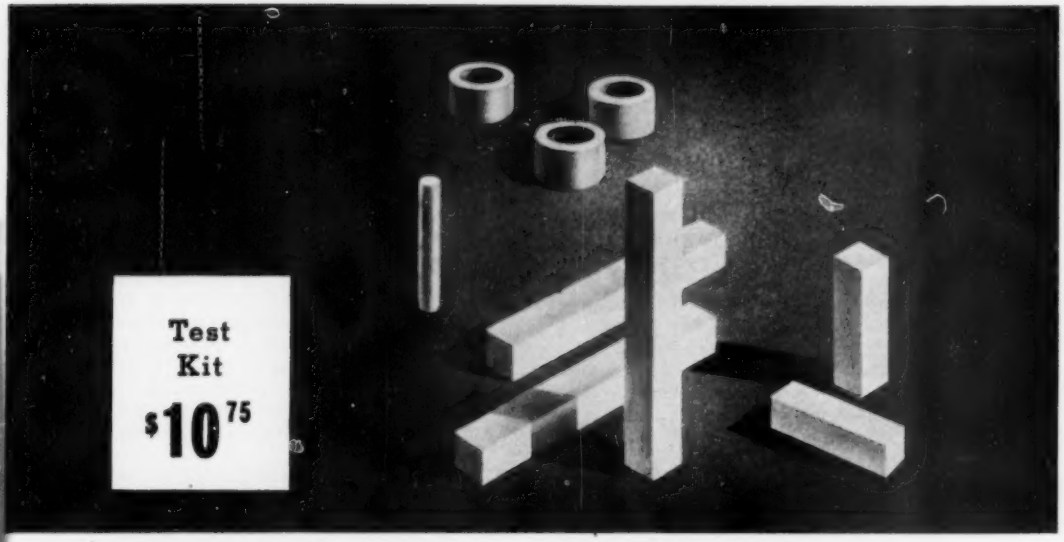
• • •

Cancellations have not yet ended. But Air Force officials say that the big bulge in cancellations is over. Air Force intends to keep on order the machines for the 95-wing program.

Most of the future cancellations are likely to be on "specials," not on standard machines.

BF

Now, TEST NEW CARBOLOY *for corrosion,*



FOR METALLURGISTS! ENGINEERS! PRODUCT DESIGNERS! Lab-test kit of new Grade 608 Carboloy Chrome Carbide. Includes: three bars ¼" square x 2"; two bars ¼" square x 1"; three bushings 5/16" long, ½" O.D., 5/16" I.D.; one rod ⅛" diameter x 1" long. (Bulletin WR-104 included.) Samples adequate for wide range of metallurgical and chemical tests. Additional information relative to your application free, on request, from Carboloy engineers. Order kit for your preliminary testing today. Check new Grade 608 Chrome Carbide against your requirements *now*. See properties and test results below.

Properties and test results of Grade 608

THE OUTSTANDING properties of Grade 608 Cemented Chrome Carbide promise to open new cost-saving applications throughout industry. You may wish to expedite your initial test appraisals by starting with the above test kit now, pending larger quantities or supplies as production facilities expand.

Physical Properties

(Grade 608)

Composition: 83% $CR_3 C_2$
2% WC
15% Ni

Hardness (Nominal): 88 Rockwell "A"

Density (Nominal): 7.0 gms/cm³ (Slightly lighter than S.A.E. 1095 steel)

Transverse Rupture Strength: 100,000 P.S.I.

Coefficient of Thermal Expansion: 6.4 in range of 70° —1292°F.

Relative Abrasive Resistance: Dry Al Oxide—58.0

Test Results

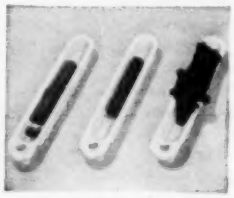
Salt spray. After subjection to a 30% salt spray for 750 hours, Grade 608 still retained its metallic lustre.

Sulphuric acid. With sulphuric acid as the corrosive agent, Grade 608 showed about 30 times the resistance of 18-8 stainless steel, and 3 times the resistance of tungsten carbides.

Nitric acid. Using nitric acid, the resistance to corrosion was approximately 8 times that of other carbides and twice that of stainless steel.

Steam erosion. Tests indicate a resistance to steam erosion approximately 60 times that of conventional carbides.

Lactic or citric acid. Grade 608 was practically inert under all conditions when exposed to lactic or citric acid.



OXIDATION RESISTANCE. (Left to right.) Samples of 18-8 stainless steel, Grade 608 Chrome Carbide and tungsten carbide after exposure in air at 1850°F. for 24 hours. All were originally identical in shape and size. Grade 608 Chrome Carbide appears to be virtually completely resistant to oxidation at all temperatures up to 1000°C. (1832°F.). Samples subjected to 1850°F. were only slightly discolored.

CEMENTED CHROME CARBIDE
abrasion, erosion

New Grade 608 Carboloy Cemented Chrome Carbide, first of the new Series 600 Chrome Carbides, with chromium as principal ingredient, gives high resistance to corrosion or erosion, combined with good abrasion resistance. Opens new areas for carbide benefits, new product design. First sample test quantities now available; production quantities soon. For properties, sample kit, suggested uses of this great new Carboloy created-metal, see below.

Now available for your product designers, process engineers and metallurgists . . . sample test quantities of Carboloy Grade 608 Cemented Chrome Carbide, first in an entirely new series of metallic carbides.

Series 600 Chrome Carbides contain chromium as the principal ingredient. They are cobalt-free and practically tungsten-free. They feature high resistance to corrosion or erosion, combined with good abrasion resistance.

Field tests already point up exciting new areas where Series 600 will bring new cuts in costs, new highs in performance. Undoubtedly, *your* field, *your* product may benefit, too. Use sample kit to start your preliminary metallurgical and chemical tests of Grade 608 today.

An expansion of carbides

Series 600 Chrome Carbides are light in weight, completely nonmagnetic and have a coefficient of thermal expansion about the same as that of steel. They are as machineable and as hard as tungsten carbides. They are stable and strong.

Fabricating and finishing techniques are the same as tungsten carbides. A flash plating of nickel makes Chrome Carbide blanks (as sintered or as ground) readily brazable with conventional brazing materials.

Series 600 may overlap a few tungsten carbide applications. But because of their unusual wear-proofing properties, their wear- and corrosion-resistance, look to Chrome Carbides for famous carbide benefits in many new areas of industrial and product applications. Here may be new opportunities for you, starting with Grade 608.

GAGE ANVILS currently being made of Grade 608 Chrome Carbide. In gage blocks, ring gages, plug gages and gage anvils, Chrome Carbide has already shown an outstanding ability to resist corrosion and abrasion. Since its coefficient of thermal expansion is about the same as that of steel, readings are not affected by temperature variations.

MICROSTRUCTURE of Carboloy Grade 608 Chrome Carbide shows appearance unlike any other metal. Note, particularly, the uniformity and interlocking character of the grain structure. Chrome Carbide is lighter in weight than tungsten carbide; facilitates handling and use of solid carbide. It will pay to start your laboratory tests on Chrome Carbides now.

WHERE CAN YOU USE GRADE 608 CHROME CARBIDE?

Field tests indicate new Series 600 Chrome Carbides offer unusually high resistance to corrosion or erosion combined with good abrasion resistance. For example, the following applications are suggested for Grade 608. Where else can you use Grade 608 Chrome Carbide?

Sheer blades for molten glass

Core pins for baking ceramic parts

Fishing rod guides

Centrifuge nozzles, separating equipment

Bearings where corrosives are present

Textile guides

Nozzles and valves: soaps, fats, oils, foods, chemicals, petroleum products, pharmaceuticals, fruit juices

Valve and core pins, die casting

Punches for movie film

For many applications where stainless steel is not sufficiently abrasion-resistant

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Detroit 32, Michigan

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Use Coupon *to order sample kit today*

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11149 East 8 Mile Road, Detroit 32, Michigan

Please send ( ) sample test kits of Grade 608 Carboloy Cemented Chrome Carbide at special price of $10.75 each. (Technical Bulletin included.)

Enclosed is ☐ Check ☐ Money Order ☐ Purchase Order for $_____

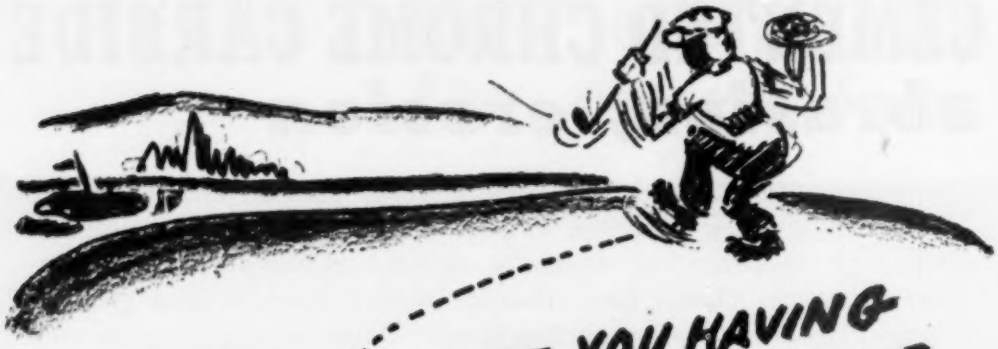
☐ Please invoice us.

☐ Please send Technical Bulletin WR-104 only.

Send to _____ Title _____

Name of Company _____

Address _____ City & Zone _____ State _____

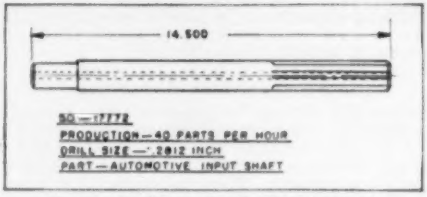


ARE YOU HAVING HOLE TROUBLE TOO?

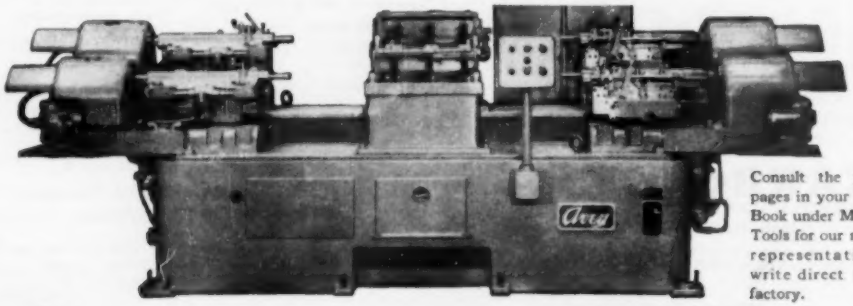
LET Avey ENGINEERS SOLVE YOUR PROBLEM!

HORIZONTAL DEEP HOLE DRILLING MACHINE

S. O. No. 17772 — Consists of four No. 1 *Avey-draulic* (hydraulic) Deep Hole Drilling Units mounted horizontally on a well-ribbed fabricated steel base. The Units having 12" ram travel were arranged in pairs to drill a $\frac{7}{32}$" diameter hole 14¼" deep from both ends. An electrical interlock was provided to prevent drill interference. The coolant system and hydraulic power source were incorporated in the base. Machine as illustrated conformed to Automotive Standards. Write for literature.



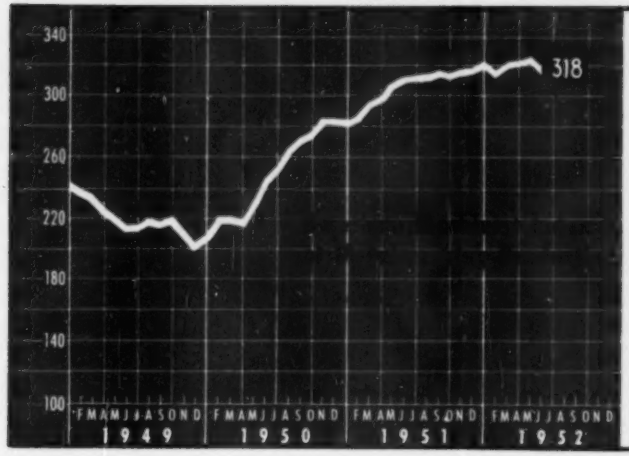
Fixtures—The fixtures were Vee Block type hand clamping to accommodate one part each.
Material—8641 Steel.



Consult the yellow pages in your Phone Book under Machine Tools for our nearest representative or write direct to the factory.

Avey DRILLING MACHINE CO.
CINCINNATI 1, OHIO

Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUNE '52*	MAY '52(p)	APR '51(r)	MAY '51
	318	**318**	**318**	**309**
Machinery	315	318	302	
Electrical Manufacturing	347	350	358	
Automobiles, Trucks	231	226	245	
Transportation Equipment	515	503	373	
Other Metalworking	306	309	321	

* Estimated (p) Preliminary (r) Revised

The steel strike is beginning to be felt in metalworking operations. It is causing curtailment of production here and there. And mass shutdowns loom in Detroit and elsewhere this month.

Even a sudden resumption of steel making will not stop companies from going to shorter workweeks or from a complete halt.

Steel in the pipelines is being used up rapidly. These pipelines will have to be filled again as soon as enough tonnage is available.

• • •

Take Cleveland as a sample. Many manufacturers are prolonging operations by cutting down to 3-4 days a week. Most of them are planning to give their employees their annual vacations at the time that they are forced by lack of steel to shut up shop. Unions generally are going along with these plans.

Cadillac tank factory expects normal schedules to hold the next few weeks, as its suppliers are getting government aid in locating steel.

"Hanging on the ropes" and facing shutdowns are: Midland Steel Products, Chevrolet parts plant, 2-3 home appliance makers, and several stamping and forging shops.

Lamson & Sessions has dropped down 20% and will substitute a two-weeks' vacation for one week as first planned.

One Cleveland plant (and others are in the same fix) said, "Our customers are going to close us down—lack of orders."

• • •

Aside from the widespread effects of steel, metalworking companies have badly unbalanced inventories of other metals.

Something new is ahead in copper: the outlook for the last half is relatively bright.

Increased imports, thanks to changes in price policy, are responsible for:

(1) An extra allotment of 100 million lb of copper for third quarter to consumer durable goods makers (bringing them from 35% of pre-Korean use to 50%); and

(2) Boosting from 500 lb to 10,000 lb the self-certification priority allowances to small users;

(3) Liberalization of copper restrictions on construction projects.

• • •

Aluminum situation is much improved. As in copper, self-certification priority allowances for small consumers have been upped from 1000 to 20,000 lb and construction limitations on aluminum have been sharply eased.

• • •

Military contract letting jumped to $8 billion in June. That was to clear the books of contract money which might be lost if carried over into the next fiscal year.

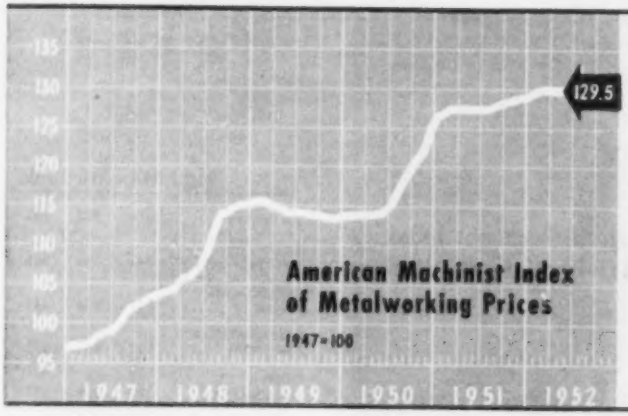
It will drop back to around $5 billion this month and probably will stay there until late fall, climbing then to $6 billion in December.

Actual military spending, reflecting current production, is at rate of $4 billion a month. Prediction: Increase to $5 billion is likely before end of the year.

• • •

West Coast metalworking production has been less affected by the steel shutdown than other parts of the country. Inventories, plus warehouse commitments and tonnage en route from eastern mills, will keep things going awhile. Air frame makers are in good shape.

Gaging Business



PRICE INDEX

	JUNE '52*	MAY '52	APR '52	MAY '51
	129.5	**129.6**	**129.7**	**127.8**
Metalworking Machinery	136.6	136.6	136.7	133.7
Other Machinery except Elect.	132.5	132.5	132.5	132.1
Electrical Machinery	125.9	125.9	125.9	126.8
Fabricated Metal Products	127.8	127.9	127.9	124.8

* Estimated

Capital spending for new plant and equipment the remainder of this year promises to be high, on basis of government checks.

But the prolonged steel strike may have considerable influence on what happens from here on.

Loss of more than 10 million tons of steel thus far may lead to deferment of capital outlays.

It may result in abandonment altogether of some projects. At least things point that way.

• • •

Industrial production continues to move sideways. Unemployment in May was about on the same level as in April and as in May of last year.

Ratio of unemployed to civilian workers, around 2.6%, was unchanged from a year ago.

Some 61.2 million people were employed in May. That was 1 million more than the previous month.

Non-agricultural employment in May showed a gain of 500,000 workers over April, 1952, and over May, 1951.

• • •

Prices have pointed downward a bit this year, but they have been relatively stable.

Mild declines have occurred at both wholesale and retail levels.

Industrial prices dipped only 1% in first six months of the year.

Cost of living has gone up and down in a narrow range in the same period.

• • •

Personal income was up slightly in April compared with March. The actual figure was $258.9 billion on an annual basis.

The total was 5% higher in the first four months of 1952 than in the same months a year ago.

May and June may not show up quite so well because of reduced earnings due to strikes.

• • •

Housing starts this year are put at 600,000 units up to now. This is just a bit off from the total in the same period of 1951. Nevertheless it is exceptionally good.

Housing starts the next few months are expected to top last year's record. The year as a whole should compare favorably with last year.

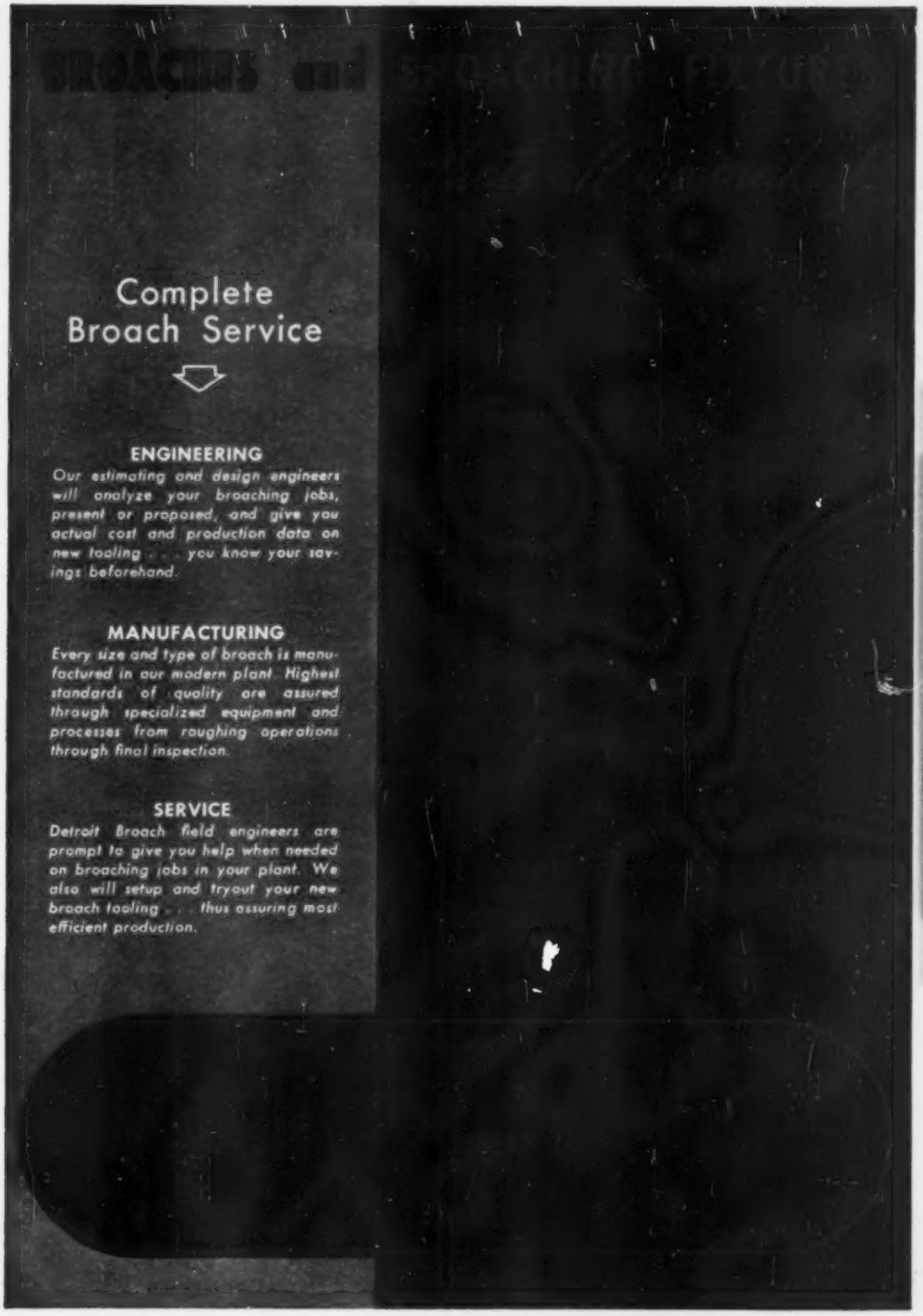
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	217.8	219.3	228.9
Steel ingot operation (thousands of tons)	252	252	2,055
Electric power output (million kilowatt hours)	7,126	7,005	6,747
Production of automobiles and trucks	129,574	130,544	158,909
Engineering construction awards (*Engineering News-Record*, millions)	$365.1	$305.7	$316.7

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	214	216	222
Index of durable manufacturers production (1935-1939 = 100)*	275	276	276
Durable goods manufacturers' sales, millions*	$23,444	$23,209	$18,171
Electrical machinery manufacturers' sales, millions*	3,027	2,977	2,180
Other machinery manufacturers' sales, millions*	3,370	3,316	2,625
Durable goods manufacturers' new orders, millions	11,570	11,712	13,057
Electrical machinery manufacturers' new orders, millions	1,243	1,938	1,304
General machinery manufacturers' new orders, millions	2,395	2,190	2,634

* Seasonally adjusted.


Complete
Broach Service
ENGINEERING
Our estimating and design engineers will analyze your broaching jobs, present or proposed, and give you actual cost and production data on new tooling . . . you know your savings beforehand.
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Every size and type of broach is manufactured in our modern plant. Highest standards of quality are assured through specialized equipment and processes from roughing operations through final inspection.
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Detroit Broach field engineers are prompt to give you help when needed on broaching jobs in your plant. We also will setup and tryout your new broach tooling . . . thus assuring most efficient production.

. . . untouched by human hands!

. . . to plus-or-minus .035 oz.!

. . . at 12 per minute rate!

pistons balanced automatically

. . . by this amazing new

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AUTOMATIC PISTON BALANCING MACHINE

For the first time, this MORRIS Mor-Speed Production Machine makes piston balancing 100% automatic. Parts are unloaded automatically from a standard conveyor, processed or rejected and returned to the conveyor "untouched by human hands."

Underweight or grossly overweight pistons are automatically rejected without interrupting the production flow. Depending on a cycle time ranging from 5 to 8 seconds per part, production is 450 to 720 parts per hour varying with the amount of metal to be removed from each piece at 80% efficiency and to a plus-or-minus one gram accuracy limit!

MORRIS Automatic Piston Balancing Machines are used by a number of the major automotive producers. If you have a piston production line, let Morris Engineers show you case history proof of time, labor, money and floor space savings.

Write today for NEW bulletin describing and illustrating the revolutionary MORRIS Piston Balancing Machine.

The Morris Automatic Piston Balancing Machine takes only 27.3 square feet of floor space to turn out up to 12 accurately balanced pistons every minute!

a better product at less cost with precision PLUS production

Morris

THE MORRIS MACHINE TOOL COMPANY, 933 HARRIET ST., CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

The Engineer Makes A Good Foreman

GRADUATE ENGINEERS as foremen in production departments! Sounds screwy, doesn't it? But it isn't screwy at all if it is worked out as sensibly as one large metalworking manufacturer has done.

The foremanship obviously is merely a stepping stone for the young engineer. He comes out of college with a lot of theory in his head, but not much practical knowledge.

Serving as a foreman in the shop — after he has proved that he "has something" — gives him invaluable practical experience. He learns at first hand about production processes. He discovers what getting out production involves.

More than that, he acquires the know-how of handling a gang of men (or demonstrates that he is inept at it). Remember that the human side is the most important of all aspects of being a foreman.

THIS EXCELLENT training is the best possible preparation for management responsibilities later on. The more the young engineer has acquainted himself with the habits and the thinking of the men in the shop, the better executive he will be. He also will be a better engineer.

The more he knows about details of manufacturing operations, the better he will be able to solve production problems later on.

The plan to have engineers do a turn as foremen is sound. And it seems to work. There is just one hitch to it. Many young engineers are not willing to serve a stretch as foremen.

White-collar jobs have too much allure. Hardly anyone, particularly with a college degree, wants to get his hands dirty or to work down in the shop.

It is much nicer to have a job upstairs or out front. Old clothes and grease and oil have little appeal.

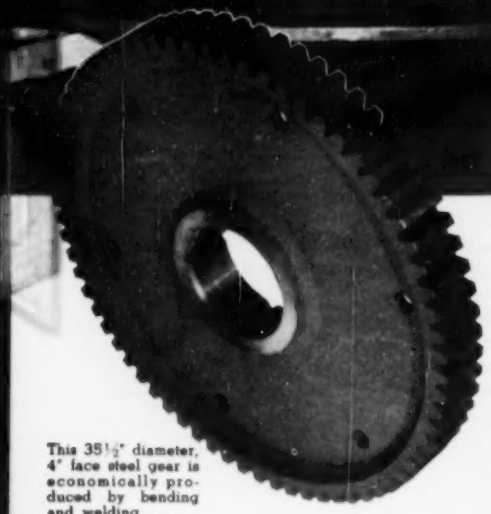
The young engineer who turns down the opportunity to be a foreman on this basis, however, is short-sighted. He is looking at the weeks ahead rather than the years. He should take the long view instead.

HERE IS A SOUND and sensible way in which to train management talent. The engineer who recognizes the value of it to himself and to his company is building solidly his own future. If he has engineering knowledge and ability to handle men and situations, he can't lose. It is all on the "plus" side.

This plan for putting young engineers into foremen's jobs should be expanded. More companies should look into it and take it up. And it is a wonderful practical training ground for potential management talent.

Burnham Finney

Wedge action die for bending rings in horizontal position. Removable inserts adapt this die for various diameters.



This 35½" diameter, 4" face steel gear is economically produced by bending and welding.

This steel gear rim is completely formed from flat bar to ring in less than two minutes by repeated hits on a Cincinnati Press Brake.

The wedge action dies require but little tonnage to bend this 2" x 4" hot rolled 35-45 carbon steel bar.

The great versatility of the Cincinnati Press Brake eliminates the need for an additional and highly specialized machine on this small-run job.

Low cost and quick changeover from job to job are among the factors that will make Cincinnati Press Brakes profitable in your shop.

Write for Press Brake Catalog B-3.

Contact our Engineering Department, who will suggest and advise on your production problems.

THE CINCINNATI SHAPER CO.

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CINCINNATI

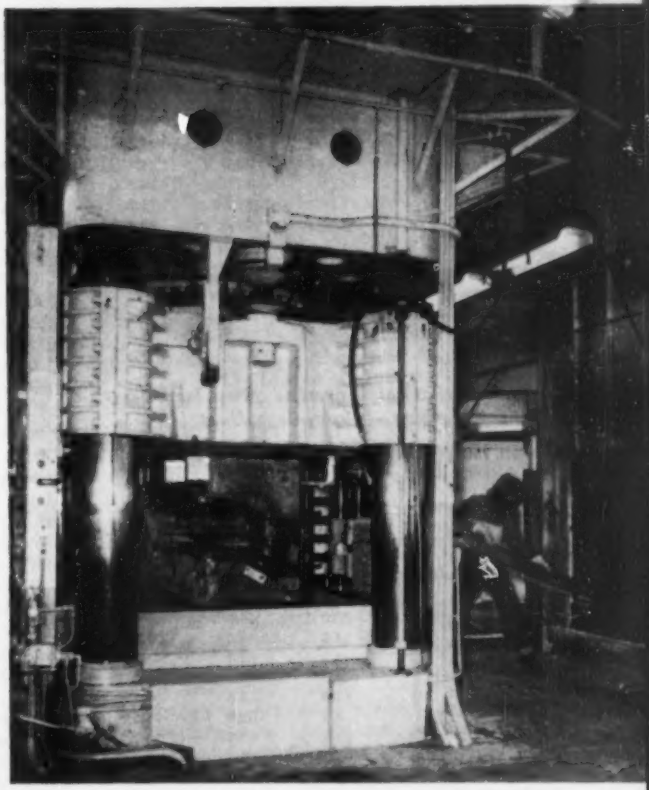
Die Quenching Precision-Forms Tough Alloys

50 to 75% savings are being realized at North American Aviation in precision-forming high-strength aluminum alloys by a new manufacturing technique called form-die quenching. Straightening operations are eliminated and many "impossible" jobs now can be formed to precise limits in a single press operation

BY JOSEPH S CORRAL
General Foreman of Machine Forming
and
LYLE R BOARTS
Foreman of Machine Forming
NORTH AMERICAN AVIATION, INC
LOS ANGELES, CALIF.

The latest major advance in the production of aircraft at North American Aviation is the development of form-die quenching — a new method of forming that produces extremely accurate contours in high-strength aluminum alloys. By combining forming and quenching, the new method eliminates the warpage and distortion that normally occurs during conventional water-quenching operations. Pieces are die-formed to close dimensional tolerances so no subsequent

1 **Form-die quenching operation**—Latest method for producing accurately formed contours in high-strength aluminum alloys is form-die quenching. Process makes possible the forming of heavy sheet and plate that previously could not be formed to close limits and, on lighter-gage stock, eliminates costly straightening operations formerly required when pieces were produced by conventional methods. Pieces are held in closed forming die until temperature of piece drops below plastic range. Die shown is water-cooled. Piece is made of heavy-gage stock



2 **Press and furnace layout**—Forming press is standard 300-ton H-P-M unit. Pieces are heated in circulating hot-air furnace at right, then are transferred at once to press. Transfer is fast to minimize temperature drop. Dies are Kirksite. Die in press is not water-cooled as piece is thin-gage and mass of die is sufficient to quench quickly by conduction. Face shield protects operator from furnace heat

table I.. Savings from Die Quenching Range From 48 to 77%

Piece	Hours Saved Per 100 Pieces	Old Method	New Method (Die Quenching)	% Saving
Canopy Beam (picture 3)	70.4	146.1	75.7	48
Top Cowl Skin (picture 4, left)	149.3	192.5	43.2	77
Lower Cowl Skin (not shown)	105.0	138.2	33.2	76
RH Canopy Skirt (picture 4, right)	39.0	58.6	19.6	67

table II.. Mechanical Properties After Form-Die Quenching — Light-Gage Sheet

Material: 75S-T6, clad, 0.064 gage
Piece: canopy beam, picture 3

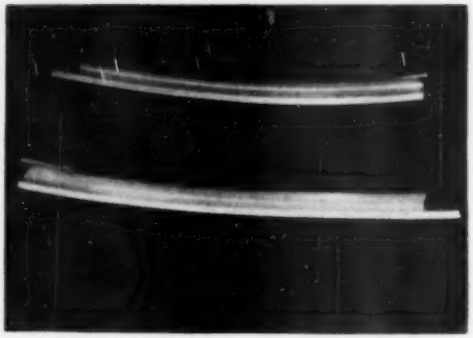
Bar numbers	Elongation % 2 in.	Yield Strength psi x 1000	Ultimate Strength psi x 1000
Required 75S-T6 (QQ A 287) Specimen No. 76	8.0	62.0	72.0
1	13.5	64.8	76.1
2	12.5	63.0	74.4
3	11.5	63.6	75.1
4	14.0	62.4	74.2
5	13.5	63.6	74.7
6	13.0	63.0	74.7
7	13.5	63.7	74.9
8	12.5	62.5	74.4

Contour Check:
The subject parts have been checked for contour by the using department and found to be acceptable.

table III.. Mechanical Properties After Form-Die Quenching — Heavy-Gage Sheet

Material: 75S-T6, clad aluminum alloy, 0.375 in. thick
Piece: deflector plate, picture 5

Bar numbers	Elongation % 2 in.	Yield Strength psi x 1000	Ultimate Strength psi x 1000
Required 75S-T6 (AN-A-10b) Specimen No. 177	8.0	62.0	72.0
No. 1	13.0	69.6	79.1
2	14.0	68.3	77.7
3	9.0	65.8	75.1
4	11.5	69.8	78.6
5	14.0	69.6	78.7
6	8.0	65.8	75.3
7	12.5	67.5	77.1
8	13.5	67.9	77.3
9	11.5	69.3	78.9
10	8.5	66.4	75.5
11	10.0	63.3	76.3
12	11.0	64.8	77.4
13	11.0	65.2	77.0



3 V-shape cross-section—Canopy beams are approximately 90 in. long and made from 0.064-in-thick 75S aluminum alloy. Beams have contours in both directions and joggles in local areas. Form-die quenching eliminates all hand straightening, reduces total forming time nearly 50%

straightening operations are required on the work.

Both light- and heavy-gage materials can be die-quenched and gages that previously were too heavy for accurate forming by any existing methods now can be produced without difficulty. Savings through elimination of straightening operations, on pieces previously formed by other methods, in some cases run as high as 75%.

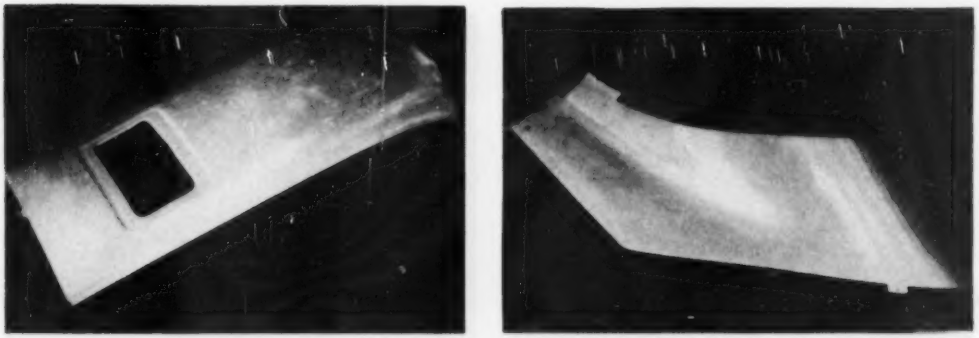
Why Is Die Quenching Needed?

Giving rise to the development of die-quenching are the demands for ever-increasing standards of performance from modern aircraft and the limitations of existing methods of forming in meeting manufacturing requirements imposed by the latest design developments. For example, one of the earliest applications of form die-quenching was in the production of wing grids for the F-86 H *Sabre* and the FJ-2 *Fury*. For years wings have been built with ribs and spars catacombed between upper and lower skins. But today's wings must be thinner, yet stronger than ever to withstand the high stress loads of high-speed, jet-propelled flight. To meet these requirements, North American engineers designed a large one-piece grid to replace much of the "bits and pieces" construction formerly specified. For forming these grids, which are machined from the solid while flat and then must be accurately contoured, die quenching is the only practical solution.

A second major requirement of modern planes is that the airfoil must have smooth surfaces and close adherence to the required contour to reduce drag and eliminate aerodynamic vibrations. The production of such high-quality assemblies is largely dependent on the accuracy and trueness of contour of the structural components that make up the finished assembly. Without die quenching, the forming of such components is a difficult production problem.

What Is Common Practice?

General practice is to fabricate formed structural members from high-strength heat-treatable alum-



4 Thin Flexible Sheet—Cowl skin, above left, is made from 0.032-in.-thick aluminum alloy sheet. Piece has compound and diagonally reversed contours. Jobs of this kind are excellent for form-die quenching as they distort badly during the water quench required in conventional forming methods. Saving in forming time is over 75%. Canopy skirt, at right, has similar characteristics and shows 67% saving when form-die quenched

inum-alloy sheet. The most common alloys in use are 24S and 75S, with 75S becoming more prevalent because of its superior strength in the heat-treated, artificially aged condition and its excellent forming properties in the annealed temper.

A large majority of formed parts are produced on hydraulic rubber-forming presses, drop hammers, or stretch-forming machines using cast or machined forming dies of designs conventional to the aircraft industry. Because of the complexity of the shape of most parts it is necessary to form while in the soft temper to stay within the forming limits of the metal.

Forming is followed by heat treating and quenching. These operations plus a low-temperature, artificial-aging treatment are necessary to develop the full structural strength of the material.

During quenching, the formed part will undergo varying degrees of warpage and local buckling caused by compressive stresses induced by drastic and non-uniform cooling of the metal in the water quench. The degree of warpage and local buckling will vary with the cross-sectional shape of the part. Parts with local recesses and relatively flat areas are particularly susceptible to the effects of the water quench and will deviate from the previously formed shape to the extent that the previous forming operation is practically nullified. Parts with corrugations, beads or deep recesses are less susceptible to the effects of the water quench, mainly because of the stiffening effect of the corrugations, beads or recesses on the part itself. Even so, additional work must be done on the part after heat-treatment to achieve the accuracy required to provide a part suitable for subsequent assembly operations.

How is Warpage Overcome?

The most common approach to the problem of warpage is to introduce some stretch in the metal after the quenching operation. Stretching removes warpage and relieves the locked-in stresses generated by the water quench.

On parts produced on stretch-forming machines, the problem is eliminated by stretch-forming the metal in the ST, or hard temper, or if necessary, by heat-treating the flat sheet and stretch-forming after the quench operation.

On some drop-hammered shapes, stretching may be accomplished by partially forming the part prior to heat-treatment. After heat-treatment the freshly quenched part is finish-formed by restriking on form dies with beads or traps on the outer periphery of the die surface.

In the restrike operation the traps or beads tend to lock the metal in the trim areas, thus making it possible to stretch the metal over the more prominent areas of the die surfaces. However, there are a wide variety of formed parts upon which the restrike operation will have little or no effect.

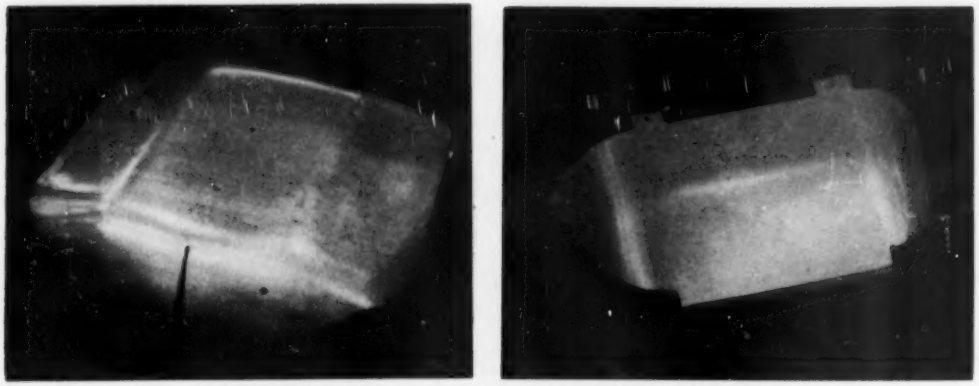
In such cases the finish-forming operations are performed by power-hammering or hand-straightening the parts to fit contour templets or check fixtures. Power-hammering and hand-working operations are performed by highly skilled craftsmen and can become costly and time-consuming, particularly on parts that require finish-forming to close tolerances. As the degree of warpage and local buckling will vary from part to part, it is almost impossible to establish repetitive procedures for finish-forming parts in this way. Results, therefore, are largely dependent on the skill of the operator.

The Form-die Quench Process

A determined search for a means of eliminating the undesirable consequences of the water quench yielded the form-die quench process. This combines the heat-treating, forming, and quenching operations into one continuous process and provides a means of producing formed parts with high structural strength to accurate contour dimensions, free of warpage and residual stresses, on a volume production basis.

The process requires a circulating hot-air furnace and a large single-acting hydraulic press with cast Kirksite dies as the forming and quenching medium.

PLEASE TURN PAGE



5 **Heavy Plate Stock**—Form-die quenching is a "must" for accurate forming of heavy stock. Deflector plate shown could not be formed satisfactorily by any other method. Piece is made of ½-in.-thick 75S aluminum alloy. Part is formed from a developed blank two at a time, then is trimmed and beveled

In the initial phase of the form-die quench cycle, the part is placed in the furnace and heated to a specified closely controlled temperature and held at that temperature until complete and even heating of the metal has been achieved. The heated part is then removed from the furnace and transferred to the lower member of a closely mated forming die anchored to the bed of the press.

Permanent Stretch Occurs

Immediately, the upper die member, attached to the press platen, descends and simultaneously forms and cools the part by metallic conduction through the relatively cold die surfaces. As the form dies constitute a large mass of metal, the die surfaces remain cool during a production run of parts made from thin-gage material. If required, as may be the case in form-die quenching heavy sections, dies are cooled by circulating water through cored-out cavities below the die surfaces. Residual stresses and springback are entirely eliminated as form-die quenching stretches the metal in all directions in fine uniform increments.

At the heat-treat temperature, the metal stretches or expands uniformly in all directions as the natural consequence of the elevated temperature. A permanent stretch or deformation of the metal is achieved by subjecting the expanded metal to high forming pressures and maintaining pressures of equal magnitude throughout the forming operation, thus preventing the metal from contracting while cooling. The percent of stretch introduced in the metal by form-die quenching is proportional to the coefficient of thermal expansion of the alloy at the processing temperature.

No Straightening Is Needed

An example of form-die quenched parts are the two canopy beams shown in picture 3. These beams previously were formed on a drop hammer, heat-treated, water-quenched and hand-fitted to a checking fixture. The total time to produce an acceptable part was approximately 85 min with 60 min for bench-working the parts to fit the checking fixture.

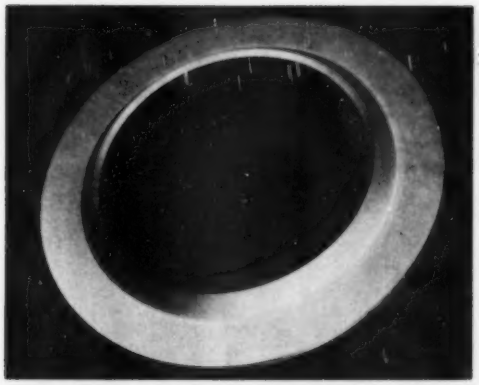
With the new process, canopy beams now are fabricated by preforming on the drop hammer and finish-forming on a large hydraulic press at high production rates. No additional work is required other than a finish-trim and the artificial aging operation normally required.

Another form-die quenched part is the cowl skin, picture 4. Parts of this type are particularly applicable to the new process because distortion in the water quench is encouraged by lack of stiffness in the part itself. Furthermore, restrike operations are seldom effective because the forming tools lack the means of introducing a sufficient amount of stretch to remove the buckles induced by the water quench.

The One Method for Thick Sheet

While the form-die quench process is economically advantageous in the fabrication of formed parts using the thin-gage materials, the process becomes mandatory when thicker sheet materials or plate stock are specified. In such cases deviations from the required contour caused by water quenching are impossible to correct by power-hammering or bench-working methods, as both lack sufficient force to work the greater volume of metal. The effectiveness of the process on parts made from plate is exemplified by the deflector plate shown in picture 5.

A fourth example is the ring show in picture 6. This piece also is made from 0.375-in. plate. Because of the sharp bend radius specified for the 45° flange, the ring normally would be produced by machining from 1½-in. thick plate. The material loss would be considerable and some hand straightening would be necessary to correct the warpage caused by relief of surface stresses in the machining operation. By heating the ring to the specified temperature and form-



6 **Formerly machined**—Ring has ¼-in. bend radius on 45° flange yet by form-die quenching can be formed in a single operation from ⅜-in. plate. Piece normally is machined from 1½-in. thick plate stock with considerable loss of material

die quenching, it is possible to produce a flat part with a ¾-in. bend radius on the 45° flange.

Physicals Exceed Specifications

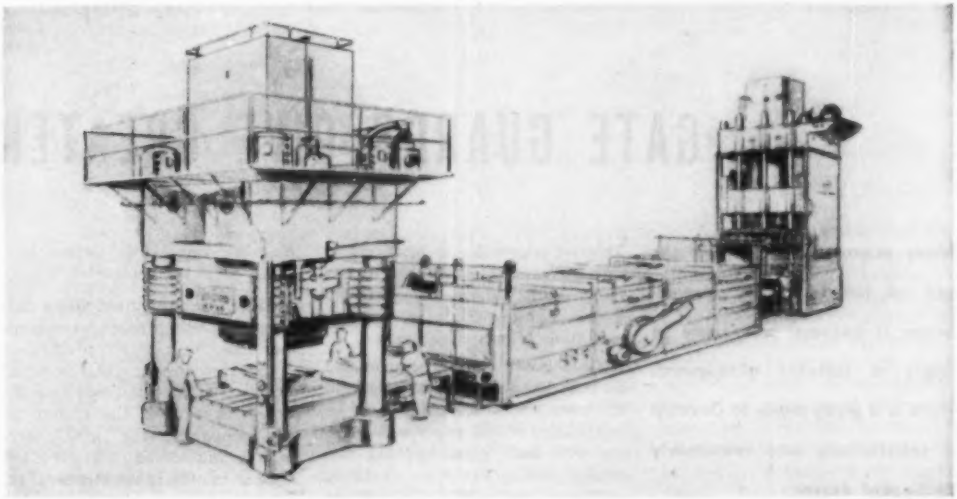
When the manufacturing procedure has been established on the initial run of parts, a test part is submitted to the metallurgical laboratory. Here the piece is tested to determine whether the procedure will produce parts with acceptable mechanical properties and to facilitate the accumulation of basic data for possible application to new designs.

Table II shows results for the canopy beam, picture 3. The properties of the form-die-quenched deflector plate, picture 5, are tabulated in Table III. Test figures show that the process produces parts that meet specifications and, in many cases, are considerably better than required.

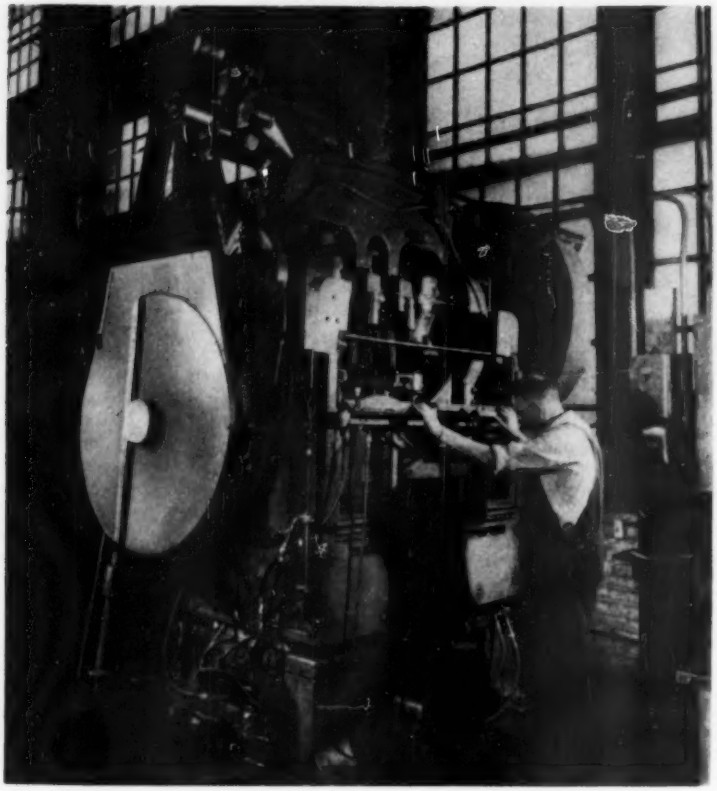
The furnace shown in the background in picture 2 is equipped with three separate compartments. At the start of the production run one part is loaded in each compartment and heated for a specified time at temperature. Compartments are loaded and unloaded at specified intervals during the production run.

Transfer of some parts from oven to press is done manually by a press loader wearing a face shield and asbestos gloves as protection from the heated air released by the furnace when the door is opened. Other heavy pieces are transferred by a specially designed handling device that reaches into the furnace to grasp the piece, then is swung 90° to place the piece in the dies. Transfer must be fast to avoid the piece dropping below the critical plastic range. This device permits rapid transfer of heavy work without excessive operator fatigue.

Further to broaden the scope of the process, North American engineers are planning the installation shown in illustration 7. In addition to the improved heating and handling facilities, the hydraulic presses also will incorporate features designed to expand the usefulness of the process. Presses will be designed to deliver impact pressure of variable magnitude within the tonnage rating of the press. Forming pressures and pressing speeds will be selectively controllable by the operator.



7 **Future installation**—Large roller-hearth furnace will be located between two presses, one of 3000 tons, the other an 1100-ton unit. A special reversible flow mechanism will provide fast delivery of heat-treated parts to both presses



Gate-guarded press, developed for study, has proved, in use on production operations, to be virtually foolproof. Operated by air pressure, flexible hose connections are provided so that several combinations of control from front and /or rear of press can be studied. Air line guard at end of press has been removed to show circuits

GATE GUARDS GIVE GREATER

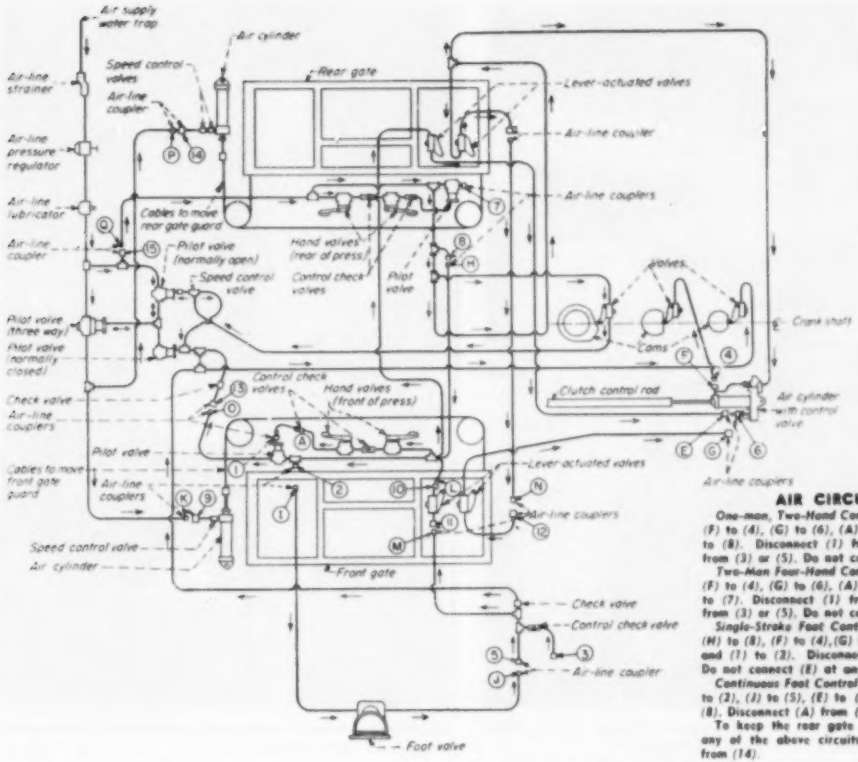
Many press setups prohibit the use of individual die guards, hence it becomes necessary to apply a suitable gate-guard. Here is a study made to develop a satisfactory and reasonably fool-proof device

SPECIFICATIONS for a pilot model gate-guard were established by our Punch Press Guards Committee to enable them to study all possible variations of design and use:

1. Gate-guards must be provided on both the front and the back of the press and these gates must be interlocked so the press will operate with both gates opening and closing during the press cycle, or with only one gate in use and the other gate locked in the closed position.

2. Actuation of the press clutch must be impossible unless both of the gates are completely closed.

3. Clutch control must allow only a single press stroke for normal operation. As most old presses are equipped with dog clutches which require that the press make a complete stroke after the clutch has been engaged, the gate-guards must remain closed until the crank stops at the top of the stroke. If the crank should repeat because of mechanical failure of the clutch or single-stroke mechanism, the gates must stay closed until the



Variety of control circuits are obtained by making connections at points indicated by circled letters and numbers. Pressure regulator in the incoming air line is set at 80 psi for all of these circuits. Many of these components are not required when a single method of control is to be used on a given press

AIR CIRCUITS

One-man, Two-Hand Control . . . Connect (F) to (4), (G) to (6), (A) to (1), and (N) to (8). Disconnect (1) from (2), and (J) from (3) or (5). Do not connect (E).

Two-Man Four-Hand Control . . . Connect (F) to (4), (G) to (6), (A) to (1), and (N) to (7). Disconnect (1) from (2), and (J) from (3) or (5). Do not connect (E).

Single-Stroke Foot Control . . . Connect (M) to (8), (F) to (4),(G) to (6), (J) to (3), and (1) to (2). Disconnect (A) from (1). Do not connect (E) at any position.

Continuous Foot Control . . . Connect (1) to (2), (J) to (5), (E) to (4), and (N) to (8). Disconnect (A) from (1), (G) from (6).

To keep the rear gate guard closed, in any of the above circuits, disconnect (P) from (14).

PRESS SAFETY

By RICHARD F. THUMA, Asst. Supt.
Maintenance & Tools Section, Genl Machinery Div
ALLIS-CHALMERS MANUFACTURING COMPANY

ram stops at the top of the stroke.

4. The press must be able to operate continuously with both gates closed, to permit use with strip stock fed through a slot in the gate.

5. Press must have a one-man, two-hand control; a two-man, four-hand control; a foot control.

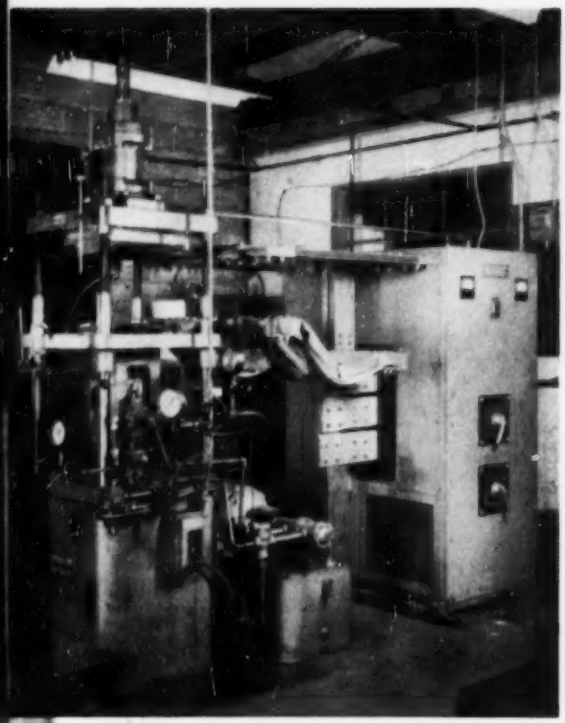
6. Gate-guards must be removable to permit changing dies.

7. Controls must be dependable, with minimum maintenance cost.

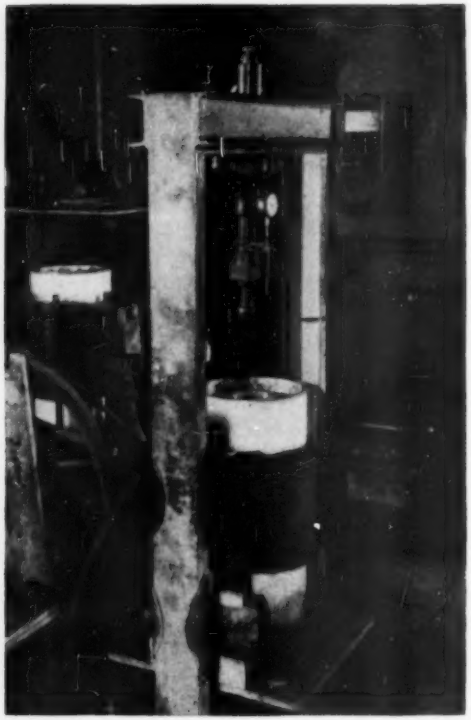
It was not our intention to equip all of our presses with such a complicated control system, but to develop a virtually foolproof press for further study in our press-guard program.

Allis-Chalmers' tool engineers worked closely with engineers from A. Schrader's Sons Div, Scovill Mfg Co, to develop and install guards and controls on a large Toledo double-crank press which would provide the desired safety measures. After several months of trial, this press was installed in a production department where it has been operating for the past two years. It has performed well under production conditions and has served as an excellent source of information in the development of gate-guards for other presses.

Quick-action couplers were used in the air lines in the control circuit, thus the circuit can be easily rearranged to provide any one of several systems. These couplers, and many of the circuit components shown in the diagram would not be required when a single method of control is to be used for a given press. Additional quick-action couplers are provided, as indicated, to permit further changes in circuit arrangement.



Resistance of carbon mold to passage of current is the means of heating metal parts in this hot-holding press



High-frequency induction-heating press is employed for hot pressing large-die powdered-metal parts

HOT MOLDING Increases Scope of

Hot molding powdered metals is a relatively new process. The equipment used, some of the applications, and the advantages and limitations of the process are described in this abstract of a paper presented at the Eighth Annual Meeting of the Metal Powder Association. Complete text will be published in the Proceedings of the Meeting

BY JEROME F KUZMICK, President
WELDED CARBIDE TOOL CO

Simultaneous application of pressure and heat to metal powders — hot pressing — has for a number of years attracted the attention of powder metallurgists. Early experiments demonstrated that:

1. Pressure required for hot molding metal powders is considerably lower than is normally used for cold pressing.

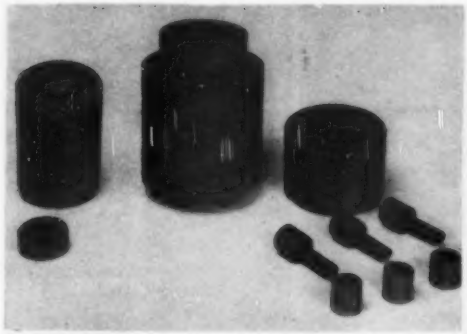
2. It is possible to hot press metal powders to solid density in one operation without sintering.

3. Properties of hot-pressed alloys are similar to those of hot-forged, or cold-worked and annealed, materials.

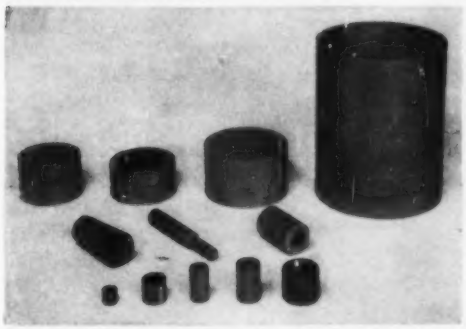
On the other hand, early experiments also pointed out some of the difficulties, such as:

1. Lack of suitable die materials to withstand elevated temperatures, which generally are about the same as the sintering temperature.

2. Rapid heating of the metal powder and need for protection against oxidation.



Graphite bar stock is machined to make molds for hot pressing large tungsten-carbide sections



Tungsten-carbide parts are pressed at relatively low pressures, about 1000 psi, and sintered at temperatures approximately those for cold-pressed parts

Powder Metallurgy

3. Prevention of welding of the compact to the die as a result of hot pressing.

4. A rapid enough cycle to make it practical.

No process is known to have been put into operation for rapidly producing hot-pressed metal-powder mechanical parts on a commercial scale; although hot pressing has been successfully applied to a number of applications involving costly materials, where this process is the only one which gives the desired results, and cost is secondary. Generally, two methods are applied:

Type 1. Hot forging—in which normally cold pressed and sintered parts are removed hot from the sintering furnace and subjected to a forging operation, usually in water-cooled steel dies.

Type 2. Hot molding—where pressing and sintering are simultaneously performed in one operation. The charge in the die may be the metal powder itself, or it may be a preform which has previously been molded by the usual cold-pressing method.

Types of Presses for Hot Molding

The simplest type of hot press consists of an ordinary vertical electric furnace built into a hydraulic or otherwise actuated press. Very often these are used for experimental and semi-production work because in most cases the rate of heating is too slow, and the setup is too unwieldy, to permit economical production runs.

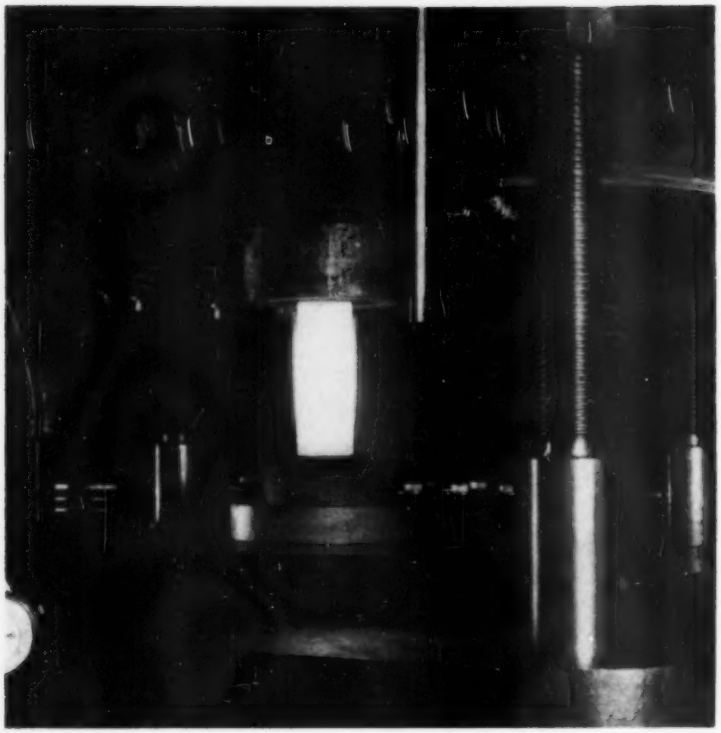
Another type often used in this country and abroad is a hot press in which a carbon mold is heated by its own resistance to the passage of an electric current. The press contains a moving lower platen actuated by a hydraulic ram. Attached to this platen is a water-cooled copper plate serving as the lower electrode. The upper platen is stationary, and contains the upper copper electrode. A hydraulic cylinder at the top of the press actuates a ram which passes through a hole in the upper platen and the upper electrode on its downward stroke. The two electrodes are connected by busbars to a transformer, a flexible bus being used for the moving lower electrode. A dial indicator is attached to the upper ram by means of an adjustable platform to measure compression during the hot pressing cycle.

A graphite spacer block is set on the lower copper electrode. The mold, loaded with powder, is set atop the graphite block, with the cavity centered under the pressing ram. An upper graphite spacer block is placed on top of the mold and has an opening in it to allow entry of the press ram in contact with the die plunger. The lower platen is raised until the die assembly is clamped between the copper electrodes. Pressure is applied to the lower platen in a greater magnitude than is used on the upper pressing ram, to insure continuous contact between the die assembly and the electrodes. The upper ram is then lowered into contact with the die plunger and the desired pressure is applied. Finally, the dial indicator is set at zero, and the current turned on.

The spacer blocks are larger in diameter than the die to concentrate the heat in the die itself. The smaller cross-section of the die offers greater resistance to the passage of the electric current, and the heat generated varies directly with the resistance and the square of the current. Temperature is measured either with an optical pyrometer or by inserting a thermocouple into the mold, and connecting the thermocouple to a pyrometer or a temperature controller.

A resistance-type hot press set up at Welded Carbide Tool Co has several refinements. An extra pressing ram has been installed underneath the lower platen, so pressure can be applied to the powder charge from both top and bottom. This permits production of fairly long, uniform, bushings, flanged pieces, and other shapes. Compression indicators attached to both upper and lower rams measure their respective travel during pressing.

A specially built 90-kva, air-cooled dry transformer is employed with a separate autotransformer



Hot pressing a carbide bushing in a graphite mold

arranged for varying secondary voltage from 1 to 10 volts, with coarse and fine adjustment to supply 30 steps for voltage range. This permits rather fine control of heating rate. An electronic contactor is encased in the transformer unit, for relaying the current to the press electrodes. A voltmeter and ammeter indicate the secondary voltage and current being used. Such resistance-type hot presses are very useful for fairly rapid hot pressing of relatively small sections. This one has been used for hot pressing carbide sections up to 4 in. in diameter and 4 in. high. Heating rate is very rapid; on small sections heat from room temperature to 2500 or 2600F can be obtained in less than one minute.

By varying mold cross-section, it is possible to concentrate the heat in any desired section. This technique is useful in producing composite materials in which one section may be made of an alloy requiring higher pressing temperatures than the rest of the piece.

For hot pressing large-diameter pieces, a high-frequency induction heating press is used. With most large sections, pressure from the top alone produces a satisfactory product, although occasionally for tall, thin, wall sections, a floating die arrangement can be used to obtain the effect of pressure from top and bottom.

A 35-kva unit supplies the high-frequency current, and a silica liner is used inside the high-frequency coil for insulation, a graphite liner being used inside the silica tube. The graphite liner radiates heat to the mold to insure uniform heating. Also, the graphite liner stays hot, so the furnace remains preheated, cutting down the time required to bring the mold to temperature. Such high-frequency hot presses are successfully used for sections as large as 24 in. in diameter.

Hot Molding Applied

Large tungsten-carbide sections have been hot pressed for some time. In this process, molds are machined from graphite bar stock. In most cases, molds are the so-called "Closing type;" that is, they are so dimensioned that the proper-size piece is produced when the plungers have compressed the carbide mixture and the outer ends of the plungers are flush with the upper and lower surfaces of the die barrel.

From the known density of the end product, the weight of the desired carbide mixture is calculated and the required volume poured into the die cavity. The plungers are lightly pressed into the cavity, and the mold positioned in the press. The piece is hot pressed at relatively low pressure, on the order of 1000 psi. Final temperature is similar to the temperature used for sintering cold pressed carbide.

usually about 2450 to 2650F depending upon cobalt content. Underpressing must be avoided because porosity will result in the finished carbide. On the other hand, overpressing will cause excessive squeezing out of cobalt binder, causing improper binder content and local segregation of cobalt, which again results in porosity or soft spots. For this reason, even with closing type molds, compression of the carbide charge is carefully measured with dial indicators.

Unfortunately, in most cases, it is impossible to salvage the graphite mold, so it is used only once. However, there are many cases where this procedure is economically practical. On plain round cylinders and bushings, standard round graphite bar stock can be purchased in a number of sizes, so often simple cutting-off and drilling operations will produce the desired mold.

On small pieces, it is possible to use multicavity molds in which several pieces are made simultaneously. For shaped pieces, it is often easier to machine a graphite mold than it is to machine presintered cold pressed carbide, which is very fragile and must be handled with extreme care. One advantage of hot-pressed carbide is the absence of shrinkage from sintering. It is well-known that cold-pressed carbide may shrink as much as 18% linearly or 50% by volume during sintering. Thus it is difficult to avoid distortion on odd-shaped pieces or long thin-walled sections which may vary in density as cold pressed. On the other hand, the hot-pressed carbide fills the mold cavity as it compresses, and the dimensions are those of the mold cavity.

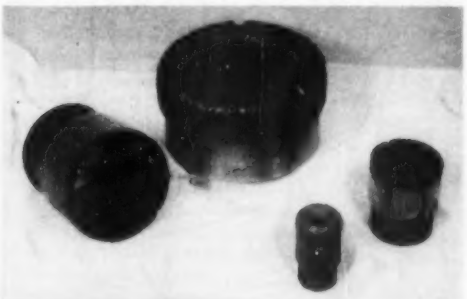
Repressing Tungsten-Carbide Dies

In these days of metal shortages, anything that can be done to conserve such strategic materials as tungsten and diamond powder is, of course, highly desirable. Hot molding is applied at Welded Carbide Tool Co to save tungsten-carbide drawing dies.

When dies have been worn beyond bore tolerance, the ID is usually ground to the next larger size. This may not be too arduous on very-small-bore dies. However, as size increases, the difficulty of this practice also increases, because the next-larger-size bore may require removal of a considerable amount of carbide, and consequent wear of diamond wheels. The bore cannot be increased very much before the die wall becomes too thin, and the sizable piece of tungsten carbide must be discarded.

Thousands of drawing dies have been salvaged in this shop by hot repressing. The die is placed in a graphite mold with a core of the desired diameter, minus several thousandths of an inch grinding allowance. The die is hot pressed in the mold, and the carbide compressed slightly as it becomes plastic, thereby filling in the bore and losing a little in height. As a result, carbide is taken out of the height, which is not critical, and transferred to fill in the bore, which is critical. The graphite molds can be used several times, and the surfaces of the carbide die retains a fairly good finish. As a result, only a few thousandths need be ground from the bore surface to produce a high degree of accuracy and finish.

One large concern which uses many dies for drawing tubing has had the same dies repressed three times, and they are still in use. It is interesting to note that die life, after repressing, has increased appreciably over that obtained on the original cold-pressed and sintered die. It is believed that this is a result of elimination of microporosity by the hot repressing operation.



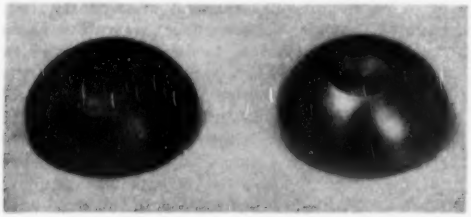
Diamond mining bits *are made of a hot-pressed metal-powder crown that holds the diamonds, and a steel shank*

Hot Molding Diamond Tools and Wheels

Some very interesting applications of the hot-press technique are being made in diamond dressing, grinding, and drilling. A good example are diamond mining bits, for exploratory, blast hole, and oil-well drilling. Many such bits were formerly — and in some cases still are — produced by casting alloys such as beryllium copper around diamonds. However, when drilling tough and broken geologic formations, such bits may show rapid metal wear and erosion, so diamonds are lost before they are worn out. Some bits are also made with a cold-pressed and sintered metal matrix. For most applications, however, hot pressing is used. Metal matrices are produced which resist wear and erosion, and retain the diamonds sufficiently well, so they are salvaged and re-used in new bits after their exposed points have been worn smooth.

A typical diamond coring bit consists of two sections, the hot-pressed metal-powder crown, holding the diamonds, and the steel shank. The crown is molded and bonded to the steel shank simultaneously. Oil-well bits are being made in sizes up to 9 in. dia containing 500 carats of diamonds, and still larger ones are contemplated.

Diamond bits are being produced with a variety of metal matrices, ranging in hardness from about 20 R_c up to the full hardness of tungsten carbide. The particular matrix used depends upon the service to which the bit will subjected and the type of formation in which the bit will be used. Hot-pressed metal-powder matrices are also employed in the production of diamond dressing tools, metal-bonded



Gyro wheel as hot pressed, left, and finish machined, right, would be very difficult to produce by cold pressing because of distortion

diamond wheels, and similar impregnated products.

Heavy Metal Products Made

A recent development is production of parts from heavy metals. For more than a decade, such parts have been made by the cold-press-sinter process. They consist of about 90% tungsten and 10% of a nickel-copper binder. Their theoretical density ranges from 16.5 to 17.2 for the usual percentages of binder employed.

Difficulties involved in the production of cold-pressed sintered heavy alloys are similar to those in sintered tungsten carbide. If it is desired to obtain densities close to theoretical, great care must be exercised in controlling particle size, purity of powders, sintering temperature, etc. During the sintering of cold-pressed pieces, shrinkage as high as 20% linearly may take place. This makes it difficult to control dimensions and to prevent distortion, particularly on large sections. For such objects as tall bushings, it is impossible to eliminate the "hour-glass" shape because of differences in density prior to sintering.

In developing the hot-press method for producing high-density materials, the usual graphite molds were used. However, one of the first problems encountered was carburizing of the tungsten by the mold. A coating was developed, which, when painted or sprayed on the mold, not only prevents this carburizing tendency, but also protects the mold itself. Thus, a number of pressings can be made from one mold.

With this method, it is relatively easy to achieve full density, and parts have been produced to densities ranging from 16.5 to 17.1, depending upon the particular composition. There is no problem of distortion, as the metal under heat and pressure completely fills the mold. The structure of the hot-pressed heavy alloy is much finer in crystal size than that of its cold pressed-sintered counterpart. This is because the hot press cycle is relatively fast, whereas sintering to high density requires sufficient time for considerable growth in the crystal size of the tungsten. Machinability of the hot-pressed alloy is considerably better than that of the sintered material, and it is believed that this is a result of the difference in crystal structure.

A rotor wheel for a gyroscope, for example, had a convex contour on one wheel surface made to definite radius. It would be very difficult to produce such an accurate contour from cold-pressed and sintered material because of distortion. With hot-pressed material, it was only necessary to remove a few thousandths of the tungsten alloy to give the required surface finish, and accuracy to tolerances of 0.0001 in. Where tolerances of 0.005 in. are satisfactory, and surface finish is not too critical, the hot-pressed piece can be used without finish machining. This particular wheel withstood speed tests of 30,000 rpm and was found to be excellent for balance. Hot pressing has been used to produce other sections which formerly required machining away as much as 50% of the tungsten alloy from the sintered piece to produce the required contour, thereby saving critical material as well as time.

Tips FOR TOP SHOP MEN

426 Time is the priceless ingredient, and the one most frequently wasted by being in a hurry. It is well to get things done, but bad if they're done so fast that they're wrong — and have to be done over. That applies not only to physical work but also to thinking.

427 Opinions presented as fact are likely to be as deceiving as time shown on a clock that's right part of the time. You're entitled to an opinion, but be sure you, as well as your hearers, know what it is.

428 Failure in experiments is not *complete* failure; it is rather *elimination* of unsuitable methods. As Edison said, we learn what "won't work" that way.

"Let's go in and punch the clock — then RUN!"

where heavy cutting pressures exist . . .

CAM-LOCK IN MANDREL PREVENTS SLIP

BY DEL HANSEN, Manufacturing Superintendent, Tractor Works, J I CASE COMPANY

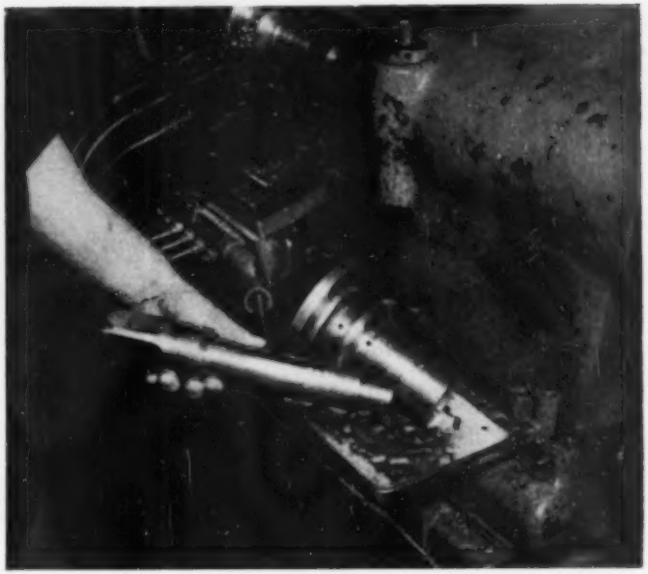
Cluster-gear forgings for Case tractor transmissions are machined in 20-in. Fay automatic lathes after bores have been core drilled and broached. Two machines are used, one for roughing cuts, the second for finishing, and the forgings are transferred from the first to the second machine without removing mandrels.

Because as many as 15 tools are cutting at the same time in the roughing lathe and 10 or more tools are used in the finishing lathe, cutting pressures are heavy. To prevent the forging from slipping, our tool engineers have developed a spiral cam-lock mandrel which provides positive drive. A half-round slot is broached in the forging bore to match a half-round lobe ground in the face of the cam for those setups where the forging is large and cuts are extremely heavy. For parts with smaller bores and where lighter cuts are to be taken, the lobe and slot are eliminated.

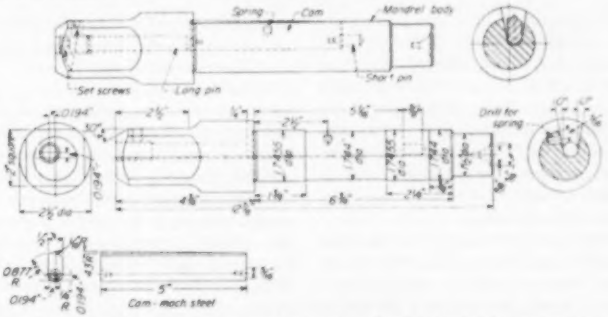
In each of the lathes, the mandrel is held between a large 60° internal center in the machine spindle and a smaller conventional center in the tailstock.

The cam-lock design makes it easy for the operator to insert and remove the mandrel without using a press.

Two drill-rod pins, each with 60°-angle points, hold the cam in its slot, as indicated in the sketch. The ½-in-dia long pin in the head end of the mandrel is held against the cam, forcing it against the short ⅜-in-dia pin at the other end by a socket-head setscrew. In locked position, this setscrew is prevented from working loose by pressure from a smaller setscrew forced against it from one side.



Cam-lock mandrel prevents slippage of big cluster-gear forgings during heavy roughing operations. It is driven by a large square on head end, which, in turn fits into a square driver bolted to the lathe faceplate

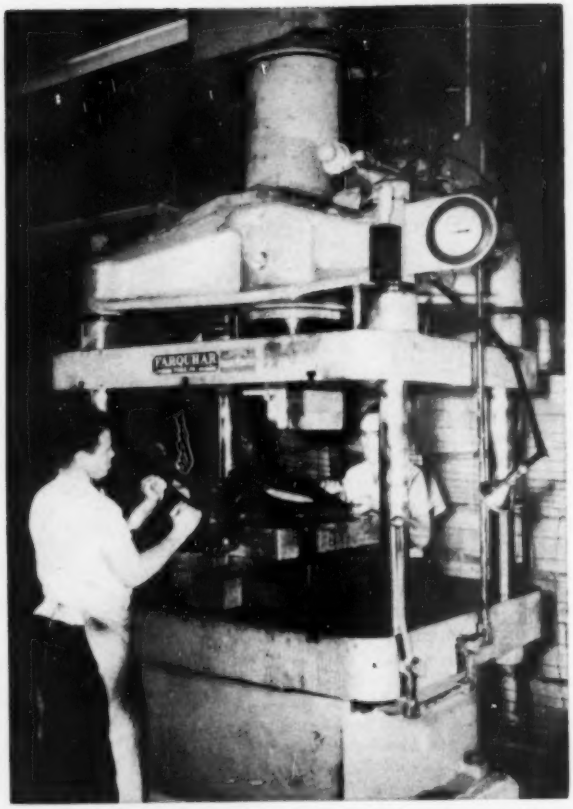


Typical mandrel for 1.750-in.-dia bore has a 8-in.-long, ⅛-in.-thick cam fit into a groove machined in the mandrel body; the groove shaped to permit 20° cam swing. A small spring set in a ¼-in-dia hole drilled in one slot slide holds the cam forward. When turning, pressure from the tools causes the forging to rotate slightly on the mandrel — forcing the cam into a locked position. The 1/16-in.-radius lobe on the cam face is tapered at angle of 43 min to aid in inserting the mandrel in the work and to allow the half-round groove to be taper broached

Simple Zinc-Alloy Dies Speed Small Orders

When your normal production effort is regularly interrupted with small orders to make sample, experimental, spare, or emergency parts, one sound cure is a short-order department. For effective operation of this department, tools and methods must be kept simple. Our cast-to-shape dies help

BY J. A. THOMSON, Head, Short Order Dept. South Wind Div., STEWART-WARNER CORP.



Zinc-alloy die drawing operations are usually performed in this 150-ton hydraulic press setup in the Short-Order Department. Die assembly shown is used for drawing a half-section for an exhaust collector used in an aircraft heat-exchanger. Stainless-steel blank is 0.025 in. thick

PRACTICALLY all of the parts produced by the Short-Order Department are sheet metal; many of them are stainless steel from 0.020 to 0.095 in. thick. Other parts use sheet aluminum, and some are made from Inconel and other high-temperature alloys. Tolerances of plus or minus 0.005 in. are frequently specified.

Many of these parts can be made only in drawing or forming dies as the time needed to make hand-hammered pieces would be out of the question. Steel dies would also require too much time and their cost would be prohibitive for the number of parts needed. Several different methods for making low-cost dies were tried, but without much success. Only one technique has proven worthwhile—the cast-to-shape zinc-alloy die.

Kirksite alloys have been used for years to make press and hammer dies for drawing and forming sheet aluminum and, in a few instances, stainless steel. But few such applications have been successful where radii to be formed are small in relation to metal thickness—and these radii are often specified when making heater parts.

As stainless-steel and Inconel parts are so frequently needed, we developed the following procedure:

Upon receiving an order, the part drawing or sample part is studied and a rough pencil sketch is prepared to describe the needed die. The size and thickness of the Kirksite sections are determined by experience, based on size of part, sheet type and thickness, and radii to be formed. Allowable body pressures, shrinkage, allowances, etc, are determined by rule-o-thumb, after discussing the die with an experienced patternmaker. No two dies present the same problems.

A low-cost wood or plaster pattern is made for either the punch or the die section, but not for both except in unusual instances. Shrinkage allowances vary with section thickness and size of radii; often will vary considerably within a given die element.

After positioning blank, steel hold-down plate with cutout to clear punch is bolted to top of die. For large dies, hold-down is so heavy two men are needed to move it on and off the die, but in spite of this, extra cost per part is justified by reduced tool cost and improved delivery

Welded exhaust collector for aircraft heat-exchanger is shown on press bed beside die in which half-sections are drawn. Blanks are cut to shape in stacks with bandsaw. Later, drawn parts are trimmed with bandsaw, nibbler, or hand shears

This pattern is used to make a plaster mold which, when dry, is used to cast a duplicate of the pattern in No. 1 Kirksite alloy. Then, the mold serves as a pattern for making a second mold to cast the mating punch or die section using the same alloy.

Casting temperature of the molten alloy must not exceed 835 F for satisfactory press tools. If the metal is too hot when poured, it usually will solidify with poor crystalline structure and will break down rapidly under forming pressures, particularly when radii are small.

Kirksite alloy cools rapidly, hence the entire mold should be filled in one pouring and pouring should be done rapidly. This also minimizes the formation of air bubbles. From our experience, the metal being poured should be directed to the center and bottom of the largest section of the casting.

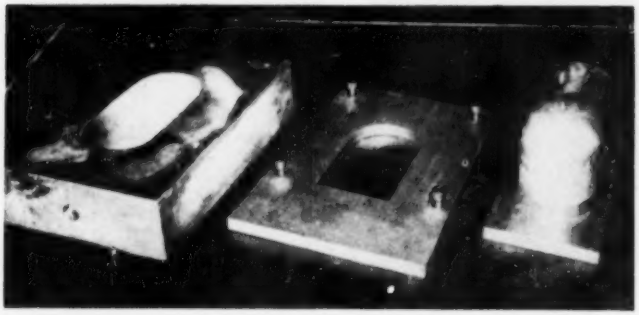
Once the pour is complete, be careful that the casting does not cool too rapidly. To maintain an even temperature through the casting as it cools, we usually play the flame from an oxy-acetylene torch over the top surface of the casting until solidification occurs. Each job is different and only experience will determine how long to apply this flame.

When time permits, a better die will result if the casting is submerged in water at room temperature, when it has cooled to the point where it can be comfortably touched with the hand, and allowed to soak for two or three days. Usually, this will result in a harder outer surface.

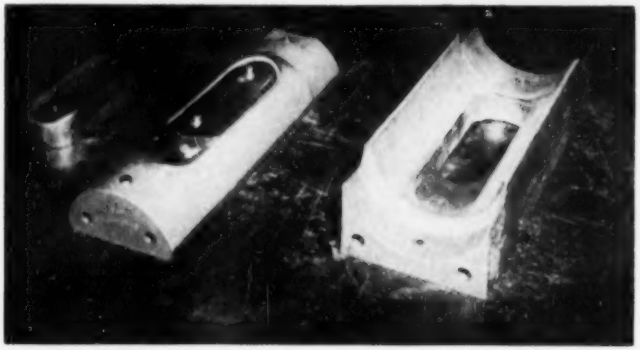
Dies and punches cast from this alloy have been used successfully to draw and form metal parts from 0.010 to 0.125 in. (for brackets, etc) thick. For thicknesses up to 0.050 in., these dies will form radii as small as 1:1. Minimum radii increases up to about 2T as stock thickness goes above 0.050 in. limit.

The ability of the die to form sharp radii can be increased in many instances by *flame-hardening* the points of greatest stress. This

Untrimmed relay cover was drawn from 0.050-in. stainless-steel blank in three-piece die (on table). Blank is clamped between die body and Kirksite hold-down. Then separate punch, not connected to ram, is inserted in slot in hold-down



Inlet adapter punch and die are made of Kirksite; hold-down is bandsawed from steel plate. Tools are used to draw the top half of the adapter from a stainless-steel blank. Die life is improved by soaking in water for two to three days



Three-piece zinc-alloy extrusion die with steel inserts is used to complete the second wrap in a heat-exchanger body. Punch draws edges of cutout in wall of stainless-steel tube. Sharp radii on dies and punches can be strengthened by *flame-hardening*—heating almost to melting point and quenching in cold water

is done by playing an oxy-acetylene flame over each die radius to heat the Kirksite surface almost to the melting point, and then quenching the die in cold water. Use care not to overheat the metal or use the flame longer than necessary to bring the metal up to temperature, as a strengthened but embrittled grain structure is obtained at stress points by this procedure. If the entire die were to be treated in this manner, the die would soon crack and break away, hence too much of the punch or die surface must not be flame-hardened.

Punches and dies made by the procedures described have been used to make exceptionally large numbers of parts. In some cases these dies have been used in the production press room for regular production until steel dies were completed, *after* the Short-Order Department had completed its emergency order.

Preparing the Blank

Sheet-metal blanks to be drawn or formed in the Kirksite dies are cut to required contour with a shear, a nibbler, or a bandsaw. At times, all three methods may be used to cut a complicated contour. Usually the desired contour is scribed on the blank from a templet. Blanks may be cut singly if only a few parts are needed, or the blanks may be stacked and the lot contour-sawed to shape. Blank sizes generally range from 2 x 2 in. to 36 x 36 in.

A steel hold-down plate usually is provided for each Kirksite draw die. This plate is cut away to clear the punch, and is bolted on top of the blank, which is placed by hand on the die surface. Mounting and removing this hold-down for each part drawn increases the time required for press-drawing operations, but simplifies die design and construction, thus makes it possible to start production of parts with the least possible delay.

Most drawing and forming operations with Kirksite dies are performed in a 150-ton Farquhar hydraulic four-post press measuring 48 x 26½-in. between posts. It has a long stroke, permitting the operators clearance for placing and removing hold-down plates without interference. When greater capacity is needed, Kirksite dies sometimes are set up in a 400-ton Lake Erie hydraulic press located in one of the production departments.

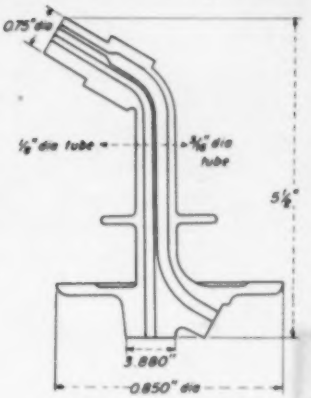
No attempt is made to provide for blank trimming in any of the Kirksite draw dies. Instead, drawn blanks are trimmed with power nibblers, hand shears, or bandsaws in a succeeding operation.

LARGE PARTS...
INTRICATE SHAPES...
DIFFICULT METALS...
ARE POSSIBLE WITH...

Skilled Investment Casting

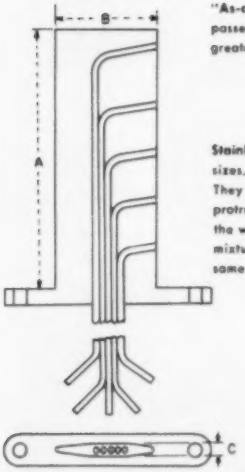
BY D F B TEDDS, FIM
BRISTOL AEROPLANE COMPANY, LTD
ENGLAND

FUEL NOZZLES



Nozzles deliver fuel into turbojet flame tubes; require two holes, one $\frac{3}{16}$ in. ID and the other $\frac{1}{8}$ in. ID, running parallel from the base flange to the nozzle end. Stainless steel tubes provide holes

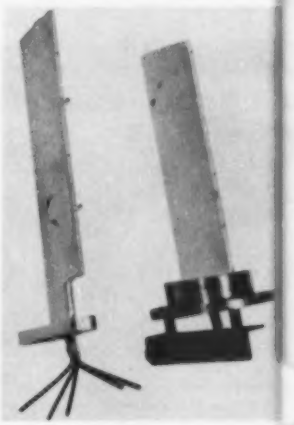
PITOT-STATIC UNITS

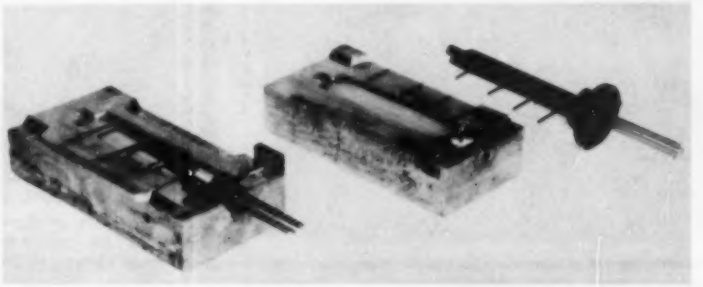


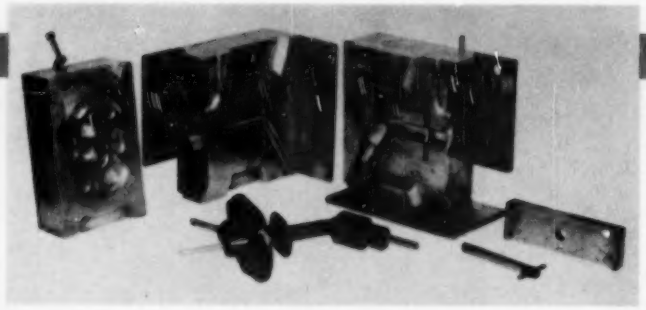
A	B	C
10"	2¼"	0.250"
6"	1"	0.260"
4"	1⅛"	0.235"

"As-cast" pitot unit and one with fitted attachments. Air was not passed through the tubes during casting as the metal chilled at a greater rate than the metal in the nozzles

Stainless-steel tube inserts were again used to produce a variety of sizes. These tubes were 0.095 in. OD x 0.012 in. wall thickness. They were located in the low-melting-point metal die with their ends protruding, thus forming "key points" in the refractory mold when the wax pattern was molded. Tube ends were closed to exclude mold mixture from the bore. Mold drying, firing, and casting followed the same procedure as with nozzles



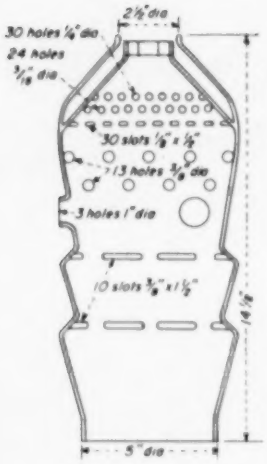


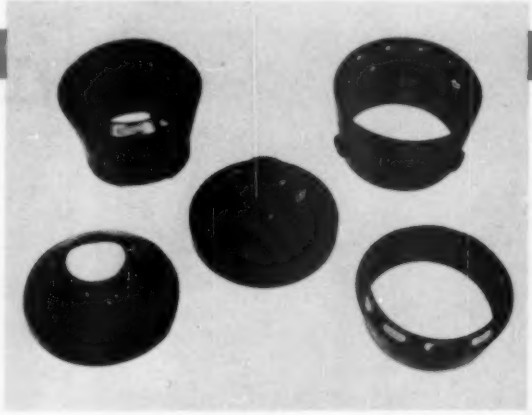


Soft metal die was produced from wooden model of nozzle, then die was used to make wax patterns. Location slots allowed stainless steel tubes (0.032 in. wall) to be positioned, and knurled steel inserts coincided with bosses under the base flange to minimize shrinkage cavitation

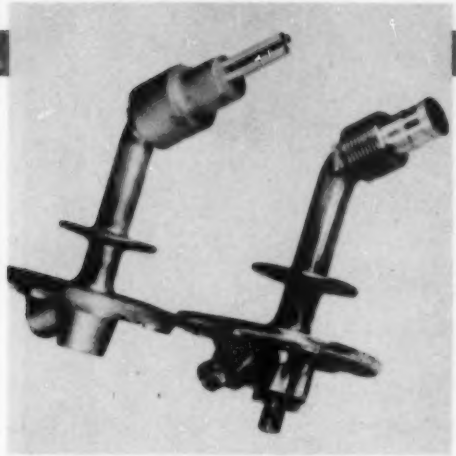
Wax runners and feeders were attached to the pattern and connecting tubes were fitted after removal from the die. Assembly was spray coated and molded, using sillimanite sand as secondary investment, ethyl silicate for bonding. A pneumatic vibrating table speeded molding

FLAME TUBES

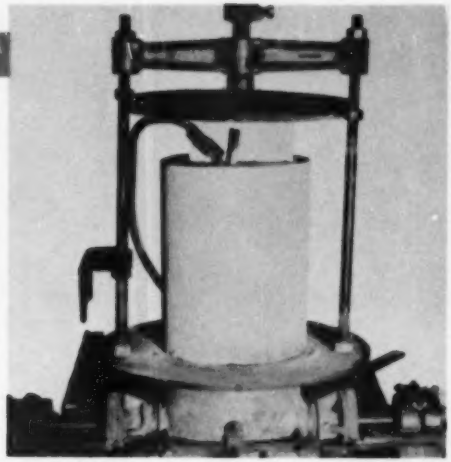




Division of the component into five sections was necessary to make production of the complete wax assembly a possibility. The die for each section was machined from magnesium alloy so that patterns of even section were produced and die weight was minimized. Normal wax-welding methods were used to assemble the five individual wax patterns into unit formation



"As Cast" and "Completed" nozzle were produced from mold which was heated for 6 hr at 45C and then for 6 hr at 120C to harden mold and melt out wax. Next, mold was transferred to a high-temperature oven and heated over a period of 5 hr to 1000C to remove residual wax, then slowly cooled to 100C. Metal was superheated to

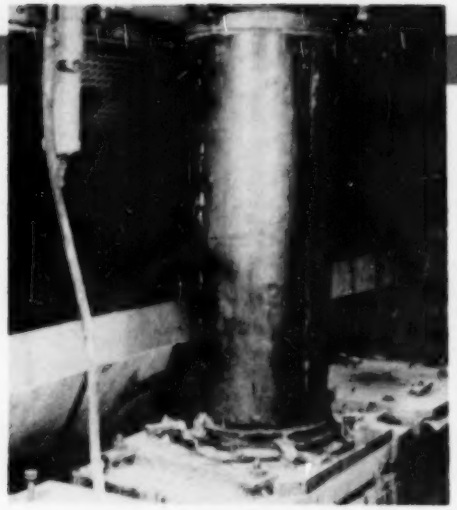


1420C for pouring. Air at 7 psi pressure was passed through the tubes during the pour and air at 7 psi was applied to the molten metal during the pour, thus assuring positive flow into the mold. After stripping the mold, the completed casting was fettled and shot-blasted

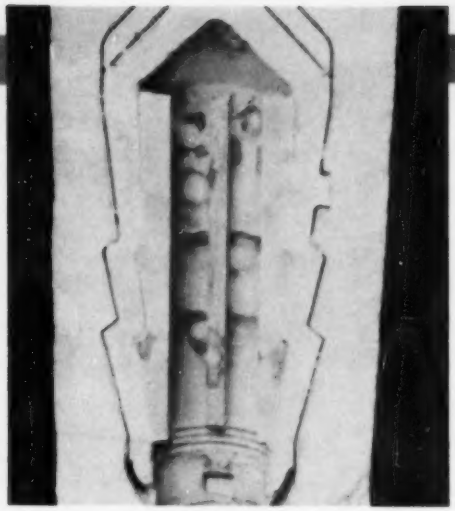
Turbine burners are usually made from heat-resisting alloy sheet such as Nimonic 75, but lost-wax casting was tried as an alternate method. Over-all length of the tube is 14.5 in. Largest OD is 6.75 in. and average wall thickness is 0.060 in. A wax core was used as hot-tearing developed in close proximity to the junction of the inner and the outer sections at the nozzle end. This core included four in-gates, to which the pattern was attached after the primary coating had been applied to its inner surface

Wax pattern assembly ready for molding, after the primary investment coating has been applied to the outer surface of the pattern. Coating was then allowed to dry before the pattern was invested completely

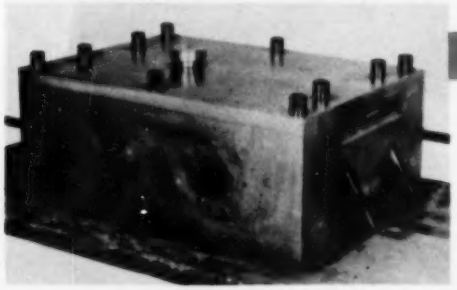
PLEASE TURN PAGE

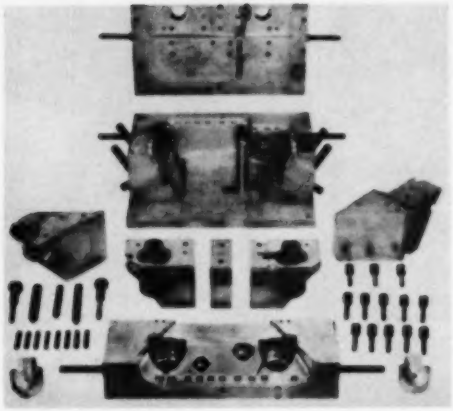


Cylindrical flask was fastened on the table of a pneumatic vibrator, operated from shop air supply through a metering unit. Flask is 10 in. dia x 24 in. high

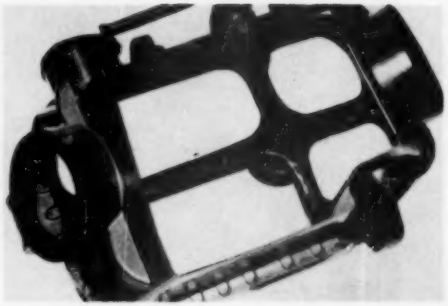


Sectioned refractory mold after wax has been removed by melting in the low-temperature oven. To complete the runner and divert the metal during casting (through the in-gates), a refractory plug was cast into the bottom end of the core



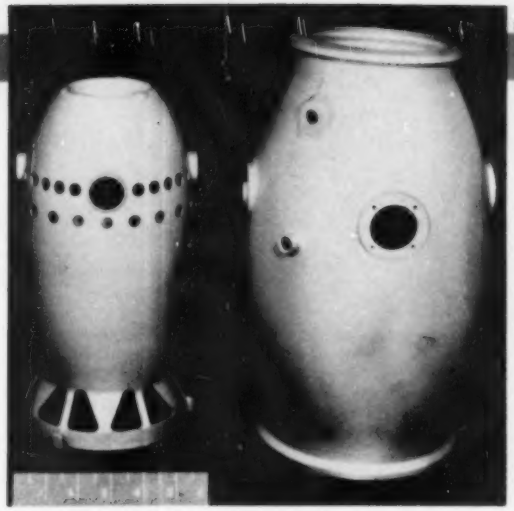


OIL SUMP

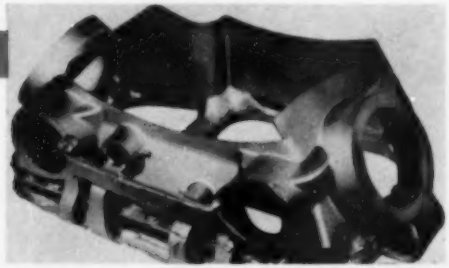


Top view of pattern shows main runner channels. **Runners were** poured separately. Heavy bosses and sections were fed to combat shrinkage cavitation. Steel flask was 24 in. x 17 in. x 12 in.; weighed 400 lb. Two pneumatic vibrators were used in tandem to vibrate the surface plate. Mold was dried for 24 hr at 130 C

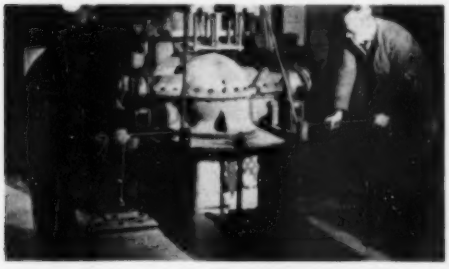
Wax injection die for the sump pattern was machined from aluminum by conventional methods. To produce the pattern, the die was warmed to 35 to 40 C prior to injecting wax at 70 psi. Thus, wax flowed to all parts of the die and pattern was removed without fracturing. The die consists of 10 major sections



Completed flame tubes are clean, smooth, accurate, and investment casting has produced contours more accurately than is possible by any other practical method. Little finishing is necessary

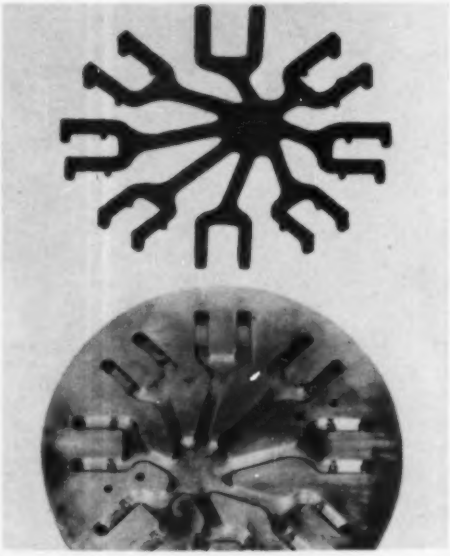


Finished casting, "as cast" and after shot blasting. Piece is 20 in. long, 12 in. wide, and 5½ in. high; average wall thickness is 0.10 in. and weight is 16½ lb. Runners and feeders can be seen, attached to the main flanges of the casting

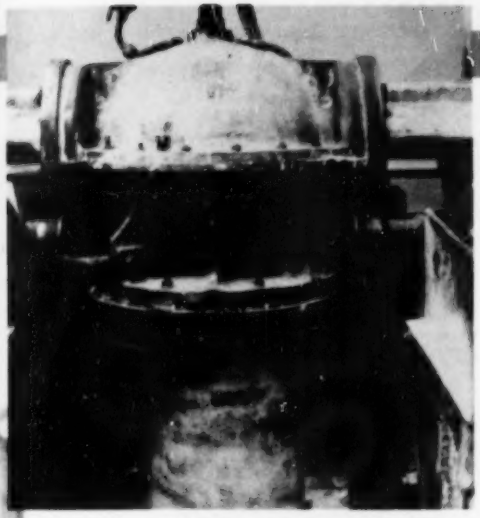


After drying, the mold was slowly fired to 1000 C over an 8 hr span in a batch oven. An indirect arc furnace, shown in the casting position, was used to melt 50 lb of metal which was cast at 1520 to 1540 C, using 7 to 9 psi air pressure behind the molten metal

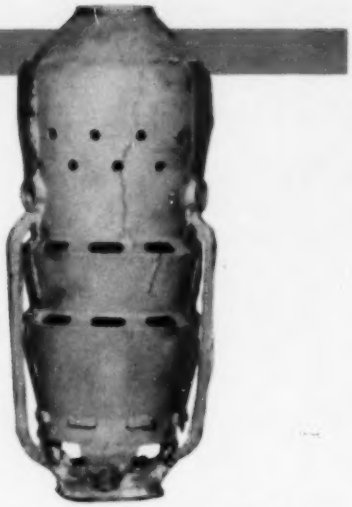
ENTRY-DUCT ASSEMBLY



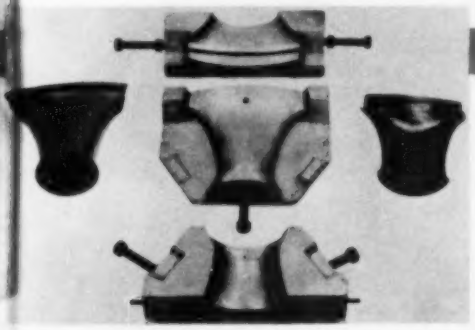
Wax runner for the complete unit was gravity poured into a machined aluminum die and located on the baseplate prior to assembly



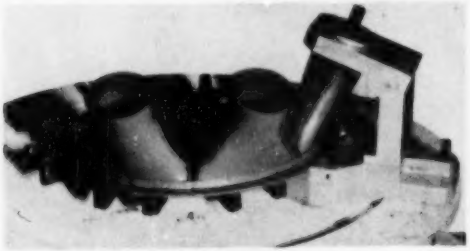
Indirect arc furnace of 15 lb. capacity was used to melt the Nimonic 75, which was poured at 1500 to 1520 C. Casting was made by fastening the flask to the furnace and then inverting the furnace through 180 deg. Air pressure of 10 to 15 psi was applied as the furnace was inverted to pour the metal



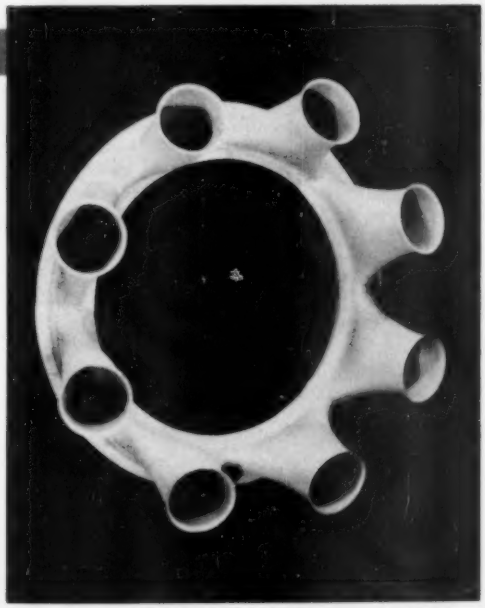
Flash lines caused by mold cracking are seen on casting after removal from mold. Subsequent molds incorporated an outside sheet of 20 gage Nimonic 75 which added strength and support to the mold



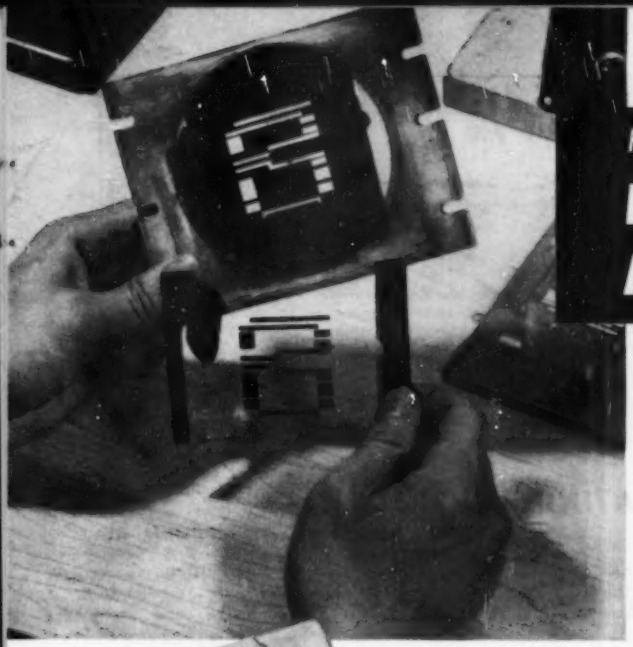
Low-melting-point metal die for entry-duct wax pattern with wax half-section and a completed wax pipe section. Originally, part consisted of eight pipe sections and was fabricated from sheet



Assembly jig was used to locate each section. Correct angle was ensured by the use of a cylindrical plug gage



Cleaned casting is 30 in. dia and weighs 53 lb. Wall thickness averages 0.080 in. Molten metal used weighed 84 lb and was cast at 1520 to 1540 C with an air pressure of 8 psi. Casting was done with the flask raised back into position around the mold



how to apply

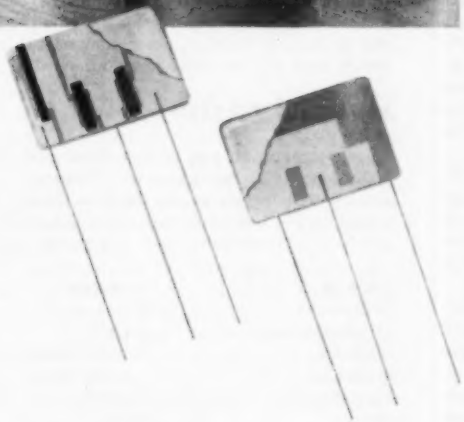
METAL TO GLASS AND CERAMICS

BY SAMUEL WEIN, Metallizing Consultant
BRONX, N. Y.

MUCH has been said of printed electrical circuits, but there are many metal coating applications, other than electrical, that can make your product better, reduce manufacturing cost, and save scarce materials. Once the practical value of these techniques is accepted, the imaginative engineer can visualize a multitude of applications. Combinations of the various materials will readily produce a part having the benefits of both conducting and non-conducting substances.

Metal coatings have been applied to ceramics since ancient times, when they were placed on the pottery as powder and fired in place. Although there is still a tremendous use of the process for decoration, the more recently developed functional applications have a far greater potential.

Little has been said of the materials and processes used in tl is phase of metalworking, hence many potential users lack the know-how needed to adopt this technique. Here we provide a broad description of methods and products, including the most recent thinking, and enough detail to supply a firm first step—



Some of the products are:

Sealed instrument windows	Laboratory equipment
Sealed stove-door windows	Labels for glass
Gasketless seals	Wear plates
Glass bushings	Displays
Special Mirrors	Lens mounts
High Temperature parts	Resistors and capacitors
Soldering points	Switches and motor controls
Kitchen ware	Shielding
Fuses	Antenna plumbing
High voltage connectors	Decorative coating
Grounding sleeves	Radiant heating panels
Photocell grids	Window de-icers

American Machinist SPECIAL REPORT NO. 313 TO THE METALWORKING INDUSTRIES

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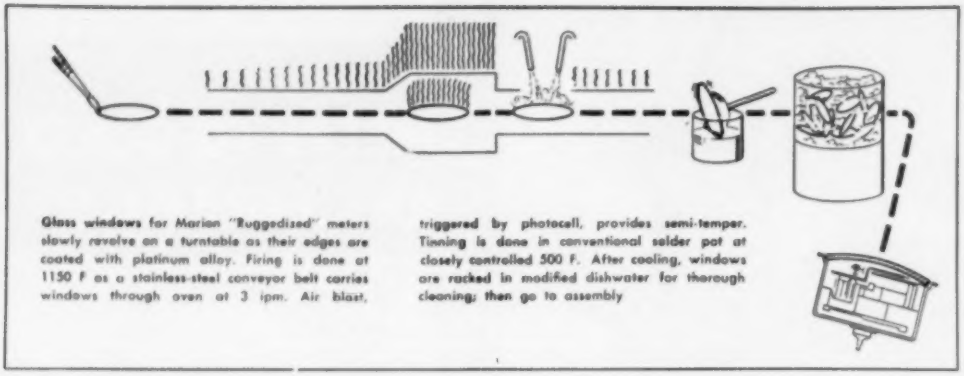


Glass windows for Marion "Ruggedized" meters slowly revolve on a turntable as their edges are coated with platinum alloy. Firing is done at 1150 F as a stainless-steel conveyor belt carries windows through oven at 3 ipm. Air blast, triggered by photocell, provides semi-temper. Tinning is done in conventional solder pot at closely controlled 500 F. After cooling, windows are racked in modified dishwater for thorough cleaning; then go to assembly

METAL COATING METHODS

METALCOATING of glass and ceramic surfaces has been done commercially for more than 75 years, the most common example being the decoration of glass tumblers with geometric designs and edges in silver, gold and other precious metals. Printed circuits are somewhat newer; first mass production by Globe-Union, Inc, Milwaukee, was 5000 printed electronic subassemblies for a mortar fuze per day during WW II. A stencil was silk-screen printed on a 0.010x1.25x1.75-in. steatite plate.

Ducas, in 1925, was first to letterpress-print circuits on a given surface from a key-plate. "Printing" was first used to describe the process by Helberger who stamped or die-cut metal foil to a specific design (in this case a resistance unit), and mounted it on a base.

Hence, printed-circuit techniques are not "new" and, in many applications, are considered "public property". However, for safety, it is good practice to check before using an unknown process.

Printed circuits are defined by Hannahs as "embodiments of electrical circuits which have been designed for easy duplication or assembly, usually by *metallizing* in combination with the graphic arts or similar rapid reproduction methods." Hannahs concludes:

1. Graphic arts may or may not be used.
2. Method always involves orientations and precise location of components.
3. Components may be used in position.
4. Circuits always have conductors closely attached to non-conductors by metallization.
5. Units tend to be two-dimensional.
6. Method lends itself to mass production.
7. Method frequently lends itself to miniaturization.
8. Unit may combine support and dielectric.
9. Unit may be produced in part with conducting inks.
10. Units are readily tested automatically.
11. Printed circuits are generally rugged.
12. Units are easily packaged, sealed, replaced, and fitted to a wide variety of circuit specifications.

Most of the methods described here are used to produce electrically or electronically conductive glass. However, many of these application techniques can be used to produce other components, some of which have no electrical connotation.

MATERIALS TREATED

So many materials can be metallized that this subject, alone, is a complete study. However, this discussion will largely be confined to those materials useful to the electrical and radio industries, commonly and successfully. Here is a partial list:

Alsimag	porcelain
Cellophane	Pyrex
cellulose esters	quartz
ceramics	rubber, natural and synthetic
diamonds	sapphire
earthenware	silica
ebonite	steatite
enamel ware	stoneware
fibers, natural and synthetic	stucco
glass	terra cotta
Isolantite	textiles
mica	vitreous enamel
paper	vulcanite
plastics (practically all)	wax
plaster of paris	wood

The metal compounds, loosely termed "metal paints," are available as very finely ground powder and as paste mixed with a suitable organic vehicle thus forming a thin, paint-like material. These are applied to a thoroughly clean surface and fired at high temperature and, thus, fused into the surface to form an integral part.

Surface preparation has no fixed rules other than the need for chemical cleanliness. Dirty surfaces

table I...DU PONT SILVER PAINTS

cause poor adhesion and provide contamination between the deposited metal and the base. Some people feel that, in addition to cleaning, the surface can be improved by etching or sandblasting, but this is relative.

Metallic silver is the most commonly used precious metal in this field, as it is least expensive, provides excellent conductivity, and is readily applied. Commercial silver paints and compounds are available from The du Pont Company and are termed "F" compounds. They are specifically designed for bonding metals to glass and ceramic bases. They contain, in addition to silver powder, a finely divided, low-melting glass in a liquid vehicle and are fired to a silvery color. An organic binder, which is burned out in the firing, gives type "F" coating a square resistance of less than 0.01 ohms, or considerably lower than that obtained with type "A".

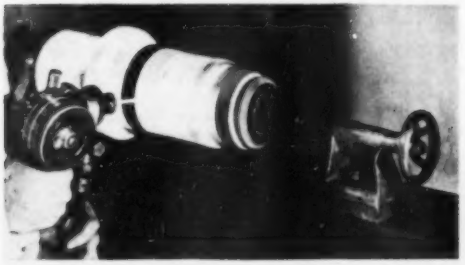
Materials within this group may be applied at paint thickness by spraying, dipping, brushing or stenciling, dependent upon the size, shape of the article to be coated, and production facilities.

One troy ounce of material covers about 3 sq ft of surface.

A number of coating materials with different characteristics have been formulated. Variations are provided to meet certain requirements, such as the base material to be coated, varying degrees of electrical resistance, adherence, and film toughness. These materials, together with characteristics, recommended thinners, and methods of application, are described in Table I.

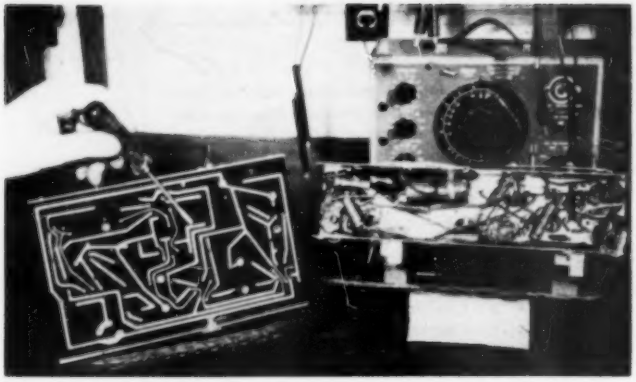
Other metallic paints for application to glass and ceramics are available. For example, products of Hanovia Chemical & Mfg Co include:

Paste No. 6 developed for hermetic sealing of ceramic crystal boxes. It is thinned with turpentine and applied by brushing. Paste is suitable for firing on unglazed ceramic at 750 C because of the unusual



Joint between porcelain insulator and metal flange must be impervious to passage of oil or air, hence parts are soldered. Porcelain must first be given metal band which is applied by mounting matte glazed porcelain in a lathe and spraying with copper to form solid band, which is then tinned. This band can be soldered to by most conventional methods

No.	For Use With	Application Method	Characteristics	Thinners
4752	Porcelain, steatite and titanium bodies; ceramic capacitors	Brush, dip or spray. Firing 1500 to 1700 F. Firing cycle 10 min to 6 hr depending on base material and equipment	High "Q" suitable for direct soldering	Butyl acetate
4338	Glass	Firing soft or low melting glass to 1000 F; heating resistance glass to 1100-1350 F. Cycle dependent on firing equipment. Spray or screen stencil. Best results obtained by giving fired silver film a copper flash, which may be followed by a tin dip or plate prior to soldering operation		
4345	Steatite, porcelain	Spray or brush. Fire at 1330 F cycle to between 20 min to 6 hr, depending on equipment. A copper flash on the fired silver film, sometimes followed by a tin dip or plate before soldering gives best results in sealing metals to ceramics. 50% lead, 50% tin, also 60% tin, 40% lead solders are satisfactory.	Suitable for solder seal	Turpentine Toluol
4383	Mica	Spray or screen stencil with hand cut "Profile screen". Firing temp. to 1050 F may vary with plant conditions. Firing cycle depends on type of equipment.	"Q" of 6000 or more depending on quality of the mica	Pine oil. Dynasope medium
4616	Mica	Screen stencil, using photographic screens of gelatin or polyvinyl alcohol. "Profile" screen not suitable. "Q" of 6000 or better depending upon quality of the mica. Firing temp. of 1050 F recommended but varies according to plant conditions. Cycle dependent upon type of firing equipment.	Same as for 4383	Butyl carbitol acetate
4666	Quartz crystals	Spray or brush. Firing temp. 950-950 F. Cycle 5-20 min	Good stability; high conductivity, suitable for direct soldering.	Butyl acetate
4731	Low expansion bodies, ceramic capacitors, steatite, porcelain	Brush. Firing temperatures 1250-1350 F cycle 10 min to 6 hr depending on base material and equipment. Spray or screen stencil. Recommended solder is 70% lead, 27% tin, 3% silver	High "Q", suitable for direct soldering	Turpentine, toluol, pine oil.
4736	Low expansion bodies, ceramic bodies.	Dip or spray. Other conditions same as for 4731, above.	Same as 4731, above	Toluol
4760	Glass.	Spray or brush. Fire at 1050 F, or for soft glass, heat resistant glass 1150-1300 F cycle depends on type of equipment. Copper flash on silvered film, sometimes followed by a tin dip or plate before soldering gives best results.	Suitable for solder seal.	Turpentine, toluol, pine oil.
4810	Mica.	Screen stencil, using photographic screens of gelatin or polyvinyl alcohol. "Profile" screen not suitable. Temp. 950-950 F may vary with plant conditions, cycle depends on type of equipment	"Q" of 6000 or more depending on quality of the mica.	Butyl carbitol acetate.
4822	Very dense, low expansion bodies as titanium ceramics.	Brush, fire at 1250 to 1350 F, cycle 10 min to 6 hr, depending on base materials and equipment.	High "Q", suitable for direct soldering.	Turpentine, toluol, pine oil
4887	All types of base materials.	Brush or spray, fire at 750-950 F, cycle 10 min to 6 hr depending on base materials and equipment.	High conductivity, good bond at low bake temps.	Turpentine toluol, pine oil.
4933	Mica	Spray, fire at 1050 F. May vary with plant conditions, cycle depends on equipment.	"Q" of 6000 or more, depending on quality of the mica.	Butyl acetate
4989	Steatite, porcelain.	Brush or spray. Fire at 1200 F. Cycle 20 min to 6 hr depending on equipment and size of ceramic. Copper flash followed by a tin dip or plate before soldering gives best results in sealing metal to ceramic, 50% lead, 50% tin and 60% tin and 40% lead solders are satisfactory.	Particularly adaptable to mass production	Turpentine
4990	Ceramic capacitors, steatite, titanium.	Dip or spray. Fire at 1310 F. Cycle depends on equipment and base material.	Water base medium. Suitable for direct soldering.	Water
5045	Mica	Screen stencil, using photographic screens of gelatin or polyvinyl alcohol. "Profile" screen not suitable. Fire at 1050 F. May vary with plant conditions. Cycle depends on type of equipment.	High viscosity ester material adaptable to multiple image screens.	Butyl carbitol acetate
5052	Low expansion bodies, steatite, titanium.	Squeegee with photographic screens of gelatin or polyvinyl alcohol. "Profile" screens not suitable. Fire at 1250-1350 F. Cycle 10 min to 6 hr depending on equipment and base materials.	High "Q", suitable for direct soldering.	Butyl carbitol acetate



"Spraywire" radio chassis (left) is contrasted with conventionally wired radio. All metallized conductors are imbedded in one side of panel and all components mounted on opposite side. Components are set in place prior to blasting and metallizing, and their contacts are sprayed into permanent connection with the conductors

activity of the thermal binder which it contains, but the paste cannot be used for firing on low-fusing ceramic glazes. However, it may be used on high-temperature glazes after the proper firing temperature has been determined. The fired film requires copper plating preparatory to tinning and soldering.

Warm and practical; decorative and functional—these are characteristic when the best qualities of conductors and non-conductors are combined to produce a needed device. This radiant-heating unit is a product of Pittsburgh Plate Glass Co. It is a good example of the decorative as well as the practical application of metal coatings to glass

An acid copper-plating bath is recommended and soldering fluxes as for silver paste #32-A.

Paste No. 13 answers the demand for a ceramic metal film that can be tinned and soldered without previous electroplating. Consequently, when the cost is not prohibitive, this film is convenient, dependable, and practicable, as rejects from burning through the film during the soldering operation are eliminated. With this paste, application can be accomplished in the same manner as with platinum paste No. 6, and the firing temperature of 750C is also right for most glazed ceramics. Tinning may be carried out directly with one of the following fluxes: For soldering with an iron a suitable flux is made by dissolving 42 grams zinc chloride and 18 grams ammonium chloride in 100 grams water. For dipping, use a flux containing 1 gram ammonium chloride in 100 grams glycerine.

Paste No. 13-A is used on glass, otherwise it is the same as No. 13. The recommended temperature for ordinary glass is 580 to 600 C for Pyrex, or fused quartz at 650 C.

Paste No. 23 is used on unglazed ceramics, otherwise same as for No. 12. For temperature, see paste #32-A.

Paste No. 28 is used on all kinds of ceramics with a temperature of approximately 750 C. For particularly refractory surfaces, the temperature may be increased to as high as 800 C. This paste can also serve as a base for direct soft soldering of small areas, as can paste No. 38.

Paste No. 32-A is used where large areas are to be coated and subsequently soldered to. The present compound will be found useful as its fired film can be plated first with copper, then with tin. It is not recommended for direct soldering and where very high conductivity is required. Plated surfaces may be used for direct soldering. This paste may be used for applications where the brush is required and if subsequent thinning is needed, the thinner in this case may be turpentine. The applied film may be fired on Pyrex glass at 680 C and on ceramics at 750 to 800 C. The exact firing temperature on ceramics must be established by firing trials, especially for

Electroplating is used to coat metal to any desired thickness. This department also plates metal parts for mechanical assembly to ceramics. Of the techniques available, electroplating and metal-spraying (not paint) provide the widest range of thicknesses.

unglazed ceramics which may have special characteristics.

Paste No. 38 is intended for application on glass of any kind. For soft glass use a maximum firing temperature of 580 C, for lime glass 600 C, and for Pyrex or fused quartz 650 C. The films thus produced may be soldered-to directly with soft solder, provided the area to be covered is small. The soldering operation should be performed rapidly in order to avoid burning through.

Silver coatings are usually made in the paste form, which may contain the metal as a highly dispersed precipitate or as a flake powder. The latter is preferred for certain applications, as conductivity is better. Special types of silver paste have been developed for use on specific materials: One of these is Paste No. 32A and another is:

Paste No. 63, intended for application on mica at a temperature of 540 C. It will also adhere very well to rock crystal (quartz) and fused quartz at a lower temperature than is necessary for Paste No. 38.

OTHER COATINGS

The Indium Corporation of America claims that an alloy of indium can be made, by using 22½ parts of Indium to 77½ parts of gold, that has a working temperature of a little above 500 C. When used on metal objects with glass inserts, this is an ideal temperature, as any temperature above 600 C is destructive to glass-to-metal seals. Furthermore, the low vapor pressure of indium prevents unwanted contamination of adjacent parts such as occurs when zinc is used in the brazing material.

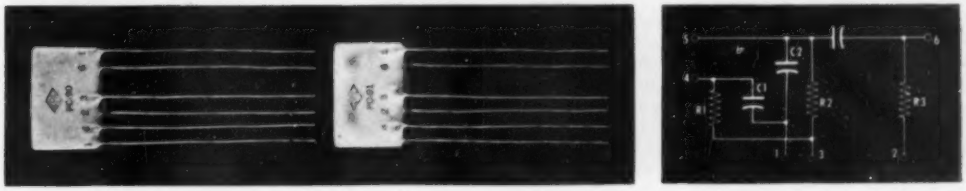
Gold is very rarely used in commerce for electrical or radio purposes. It is, however, applied to a great extent for decorating glass, particularly where chemical vapors will affect silver, as there are very few vapors that will affect metallic gold.

Platinum like gold, is applied where metallic silver cannot be, because of deleterious chemical vapors. Platinum is desirable because it has a high melting point, hence, permits hard soldering.

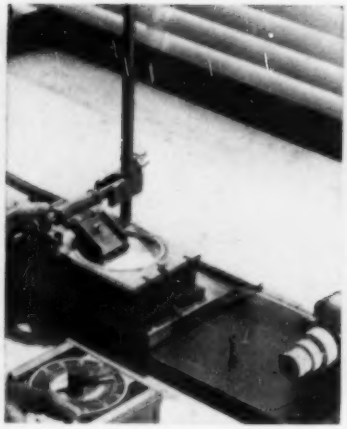
Tin: There are two producers of "tin films" on glass for electrical purposes, Pittsburgh Plate Glass Co, and Libbey-Owens-Ford Glass Co. Both are "trade secrets."

Titanium is applied by a process fostered by General Electric Co. Titanium hydride is applied to the given surface, and the hydrogen is allowed to evaporate at elevated temperature, after which the metallic film of titanium adheres so tenaciously that it can be soldered with ease.

Graphite may be applied with other ceramic and glass compounds to form high-resistance films (comparatively speaking), and likwise where the formed film will necessitate subsequent treatment such as electroplating.



Pentode Couplate combines capacitors and resistors screened and fired to a dielectric ceramic plate. The unit provides a complete pentode interstage coupling circuit in a remarkably small space



First step in applying silver coating to glass or ceramic is to make photographic negative of desired pattern. Pattern is transferred to "silk screen" (actually fine bronze wire screen) which is coated with photographically sensitive material. Portion of sensitive coating protected by opaque portions of negative are washed away; remainder form solid coating over screen . . . **"Silkscreen"** is placed over glass plaque to be coated. Silver paste is placed on the screen . . . **Spreader or squeegee** is wiped across pattern to spread silver paste evenly . . . **Screen is removed** and silver remains on glass in desired pattern. Glass plaque is placed in oven and heated to 600 C, then slowly cooled. Silver is now firmly attached to glass (tensile strength—3000 psi). Technique courtesy Sylvania Electric Products Inc

Coating Coverage: Two coating thicknesses on metallized glass and ceramic are common today. These are in the 0.000004-in. range and the 0.005-in. range. This variation in thickness depends on (1) the end application, (2) the method. There is also a matter of economy. As a basis of illustration which has been worked out mathematically by Mr Riehl of Hanovia, a film of gold measuring 0.000004 in. having a density close to that of elementary gold, and weighing 1 gram in the form of paint, will cover 800 sq in. A bottle containing 11 grams will cover about 8000 sq in. or 55 sq ft. per bottle. This formula may be used as a basis to approximate the number of pieces that can be done with 100 grams of standard bright gold. For this purpose, ascertain in square inches the area covered by the design on one piece and divide this figure into 80,000.

The foregoing figure was given as a basis for calculation, and as metallic silver is so much less expensive, the cost is that much less per 1000 sq ft.

Application Methods: There are a number of convenient method for applying the metallic paints on given surfaces. Herewith are the more common techniques used:

Manual Application: The operator dips a camel's-hair brush into the paint, of low viscosity, and applies it to the surface in the design form. This is a very tedious job, causes unevenness in design, but is one way of accomplishing the desired result.

Dipping is about the simplest way to form a film. By merely dipping the object into the viscous paint-like coating material and allowing it to drain off, the job is completed. The process is costly and uneven results are produced.

Spraying is used where large surfaces are to be covered. Small surfaces may be treated by this method, but not as economically. Spraying speeds production by cutting the time 1/3 to ¼ with respect to the brushing method. A factor to consider is the loss of precious metallic paint by the unavoidable off-spray. Thus, the method often is too wasteful to be competitive. However, most of the off-spray can be salvaged if the proper fixtures are used.

Screen printing is old, and is actually a stencil made manually by cutting the design out in a suitable medium, or photographically reproducing it on a silk sheet held under tension in a suitable frame. Through this screen, the more or less viscous metallic paint is applied with a "squeegee". Also, spraying through the stencil (silk screen) may be used. Very fine lines may be reproduced in this fashion, and economically too.

Printing: Although the literature (patent and technical) refers to *printing methods*, i.e.; the use of letterpress printing or the equivalent, there is yet no device available to accomplish this.

Offset Printing: An etched metal plate of the desired design is filled-in (the recesses) with the paint, picked up with a suitable roller, or tissue paper, and transferred to the surface. This method has been commonly used to reproduce designs, floral and geometric, for glass and ceramic surfaces.

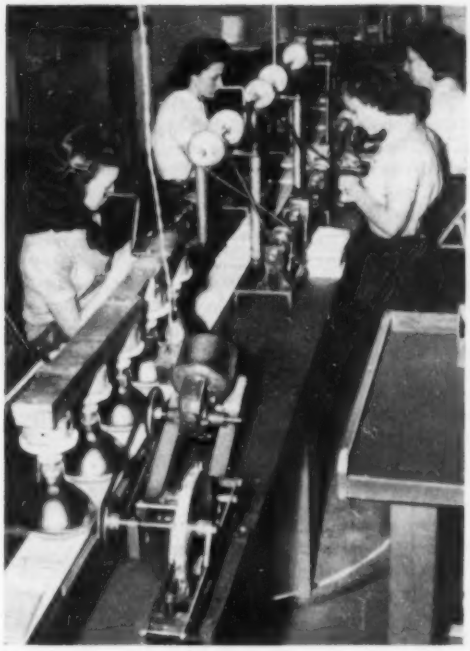
Drying: Once the film has been applied to the surface, the part is allowed to stand for a few hours in a place where there are no sudden changes in temperature (draft) and where the air is dust free.

Firing the Metallic Paint: Once the piece (glass or ceramic) has been coated or decorated by any of the methods discussed, it is heated to the socalled "ma-

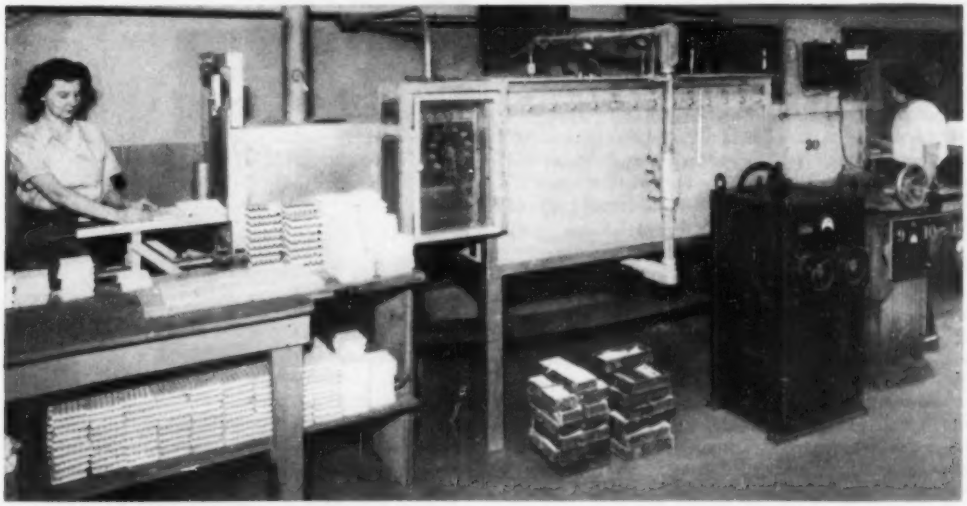
Vapor deposition of metal on ceramic materials is done in a vacuum. This technique is very effective for applying a thin coating of metal very evenly on the ceramic surface. Device shown is at American Lava Corp

turing temperature" of the metal. During this process, the essential oils volatilize, leaving the thin film of metal.

Firing Temperature is an unknown factor, because it depends a lot on the kind of glass or ceramic to be used and its specific properties. However, for lead glass use 480 C; lime glass about 600 C; Pyrex up to 650 C; quartz up to 700 C. Ceramic bodies vary from 700 to 1000 C and higher. This is usually determined by a test prior to running off a specific job.



Drying is accomplished in production by passing the metal-coated ceramics under a bank of infrared lamps, by means of a conveyor belt. Careful, even, drying is important to achieve a good bond



Firing of the metal base to the ceramic is done in a continuous furnace, on a conveyor belt. After firing, the metal base is an integral part of the ceramic. Many of the metal-coating methods make rapid production rates a simple matter to obtain

Properly fired silver will adhere tenaciously to the glass or ceramic surface, with a tensile strength of approximately 3000 psi.

Affixing Leads For Circuits: Two common methods make electrical contact to the metallized surface: (1) mechanical means, such as springs (pressure or pull), pins and eyelets; (2) soldering.

Mechanical methods are by far the simplest means for making electrical contact, but their use depends a lot on other circumstances, so a complete study of the part involved is necessary. Mechanical methods, at times, can apply the mechanical contacts to the metallized surfaces.

Soldering: A wide variety of alloys are commonly available but they vary in properties as may be expected. For instance, the melting points of these alloys may be anywhere from 115 F up to 2000 F. The selection of the proper alloy is most important, and this is largely dependent on several factors: (1) areas where it cannot be subjected to too high a temperature, and (2) where different kinds of joints between the soldered portions are needed, as in the strongest possible bond.

Solders are available in several shapes such as bars, wire, strips, powder, rings, and washers, to suit given physical conditions.

A firm connection must exist between the elements soldered; there must be no loose ends.

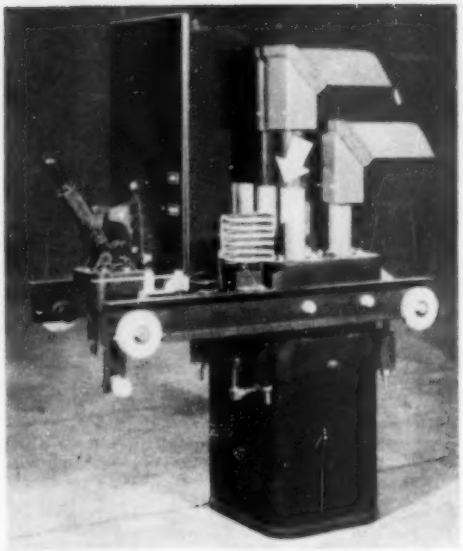
Soldering is usually done with a torch, soldering iron, dip method, or high-frequency.

Electroplating: The films of metals deposited on the glass, ceramic, or mica surfaces are usually thin. Where thicker films are required, electroplating, by conventional means, may be used.

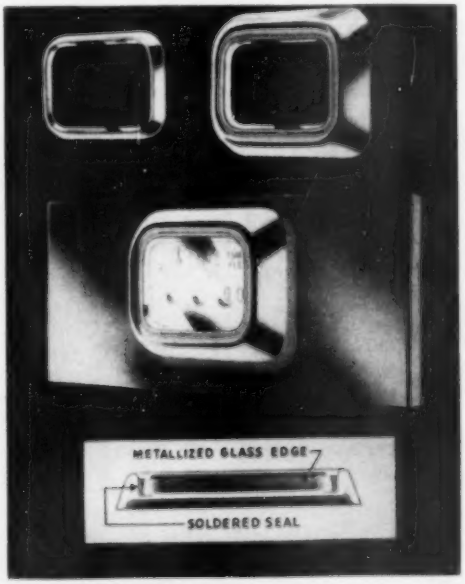
Cathode sputtering utilizes two or more electrodes situated to form a spark-gap and carrying high-voltage current. This current, passing between the electrodes, causes each cathode element to sputter or disintegrate, thus depositing the metallic material on the surface beneath the electrode. Coatings may be selenium, tungsten, aluminum, or many other elements and alloys. They are used as electrical conductors where it is necessary to place metals on non-metallic materials in producing such items as low-cost tools and top-quality optical instruments. The process is also used to make bi-metallic discs and plates for selenium rectifiers.

The evaporation process utilizes high-amperage electricity to heat-vaporize a metal, just as water is converted into steam, and these metallic vapors are deposited on both metallic and non-metallic surfaces, as necessary. No heat is carried to the latter surfaces as the particles are of molecular size and chill rapidly. Thus, smooth coatings as thin as 0.000001-in. can be accurately produced by limiting the time during which vaporization is permitted. Extremely thin vapor coatings may be transparent and are used on parts such as photographic lenses to improve light conduction by reducing reflection (coated lenses).

Both sputtering and evaporation coating are done in high-vacuum or in an inert gaseous medium to prevent oxidation of the coating materials.

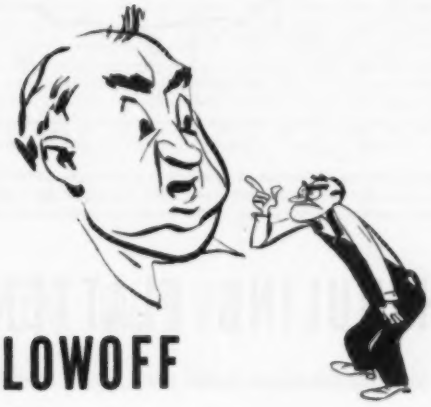


Oil circuit-breaker bushings must have a predetermined coordinated flashover and puncture value. This is obtained by metallizing the long phenolic plastic bushings with zinc, to a thickness of several mils. Sections to be sprayed are first sandblasted. Metal shields protect the other plastic surfaces. As the metal will not stick to natural glossy plastic, the excess is easily wiped off



Gas-meter glass is completely sealed by metallizing. Copper is first sprayed on the edges of the glass, to provide a perfect soldering surface for sealing the glass. In most applications, the only preparation necessary is to heat the glass prior to spray-metallizing. This method is also used to seal the double windows used in store refrigerators and for reflective and masked surfaces on light bulbs

ROUND TABLE



BLOWOFF

"I just got the shock of my life, Ed. Morton as much as told me I'm a jackass."

"Well, maybe you are, at times, Al. What'd you tell him?"

"Not much. I was too confused to really tell him off. He accused me of amateurism and contradicting myself too often."

"He might have a point, you know. Morton's judgment is darned good, and he's a level-headed cuss."

"I know. That's what's bothering me. If he was just an ordinary guy, I'd chew him out for getting too big for his britches; but he's a smart guy, and I feel mighty low about it."

"That's one trouble with being a foreman, Al. You're open to all sorts of criticism; some of it is just jealousy, but once in a while you get some that rocks you back on your heels."

"Yeah, but do I have to take it lying down? Do you think I should go back and bawl him out for minding my business, or what?"

"Maybe you'd better just let it pass. Better yet, you ought to take it into account during your daily work. Whatever he said, I'll bet he had a good point. It might be smart to take notice."

"Well, I'll sure remember what he said! But what kind of an effect is it going to have on the department? Maybe the men will lose respect for me if I let Morton get away with it."

"Did he give you the works in front of anyone?"

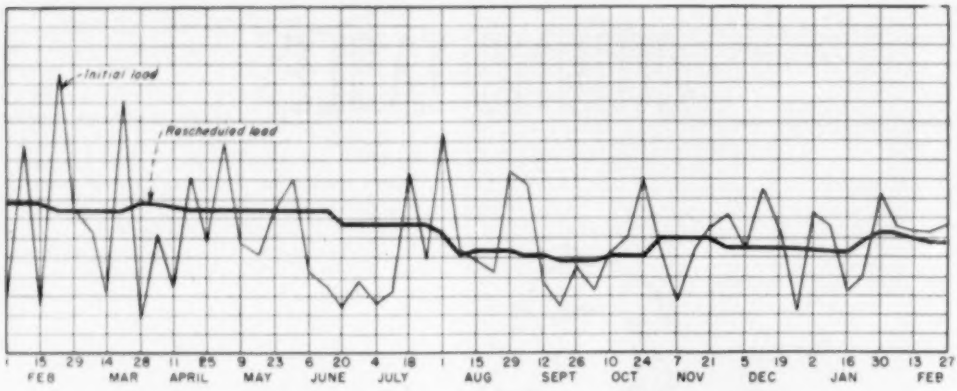
"No, just in my office. Nobody else was there."

"Then don't worry. I know Morton, and he won't mention it around the shop. He's not the kind of guy that makes a big story out of anything he gets away with."

"I sure hope so."

***HOW MUCH** can a foreman afford to take from his men, helpful or otherwise? Should he listen carefully to legitimate criticism, even from subordinates, or should he refuse to be judged by his workers? Your ideas and opinions will interest others. Discussions of earlier topics appear on later pages.*

TOTAL SHOP LOAD (ORDERS) FOR SHEET-METAL DEPARTMENT


Initial load
Rescheduled load
1 15 29 14 28 11 25 9 23 6 20 4 18 1 15 29 12 26 10 24 7 21 5 19 2 16 30 13 27
FEB MAR APRIL MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB

New shop-load plan makes molehills out of production mountains. Thin line shows number of orders that must be completed per week with initial scheduling based on date pieces are needed in assembly. Heavy line shows how re-scheduling levels load

RE-SCHEDULING FLATTENS ZIG-ZAG

Northrop's new scheduling plan for the sheet-metal shop levels machine loading, cuts work-in-

By D R HUISH, Manufacturing Control Division
Northrop Aircraft, Inc, Hawthorne, Calif.

Efficient loading of work into sheet-metal shops is one of the traditional headaches of aircraft production. Shops often swing rhythmically from intense, overtime production to periods of slack activity. To lick this problem, Northrop Aircraft, builder of *Scorpion* F-89 all-weather interceptors, has developed a tailor-made shop-loading plan that smooths out the peaks and valleys of fabrication activity.

In operation for a little more than a year, the Northrop plan holds shop loading to a minimum and greatly increases shop operating efficiency. It now is possible to turn out some 2000 orders per week with a peak backlog of only 3000 orders in the shop. As jobs for each operation are scheduled well in advance, overloads in incoming-material and accumulation-areas are avoided, and the problem of lost and damaged material is minimized. Toolcrib and warehousing operations can be much more efficient as the quantity of tools required per day and the number of orders to be filled is known. Production planning also is much more accurate as the plan warns in advance of any impending overload on the shop and indicates both the quantity and the type of work that must be placed outside if schedules are to be met.

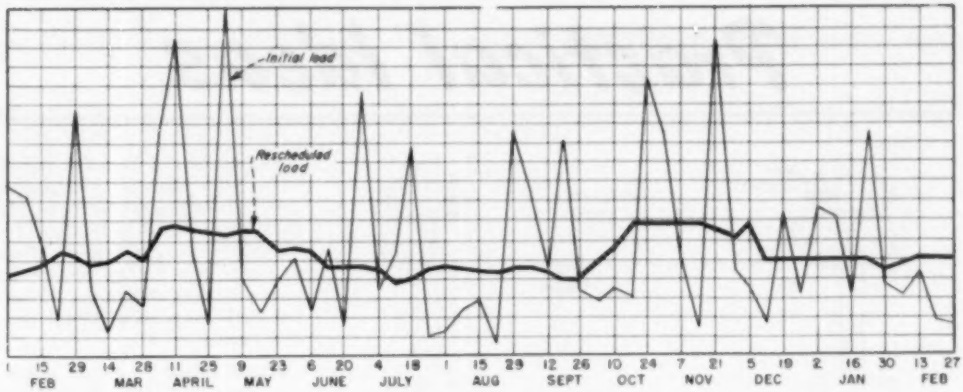
Another very valuable feature of the plan is that it does a great deal to level out manpower requirements. This eliminates the need for periodic adjustments to the work force and, in itself, contributes to the over-all efficiency of the production organization. While specially designed for aircraft production, the plan has many features adaptable to other manufacturing plants.

Is Shop Capacity Adequate?

In establishing its shop-loading plan, Northrop first determined the quantity of units to be manufactured and the delivery rate. This information was obtained from Master Schedules made up for each contract. The fabrication schedules do not establish a delivery date for each plane but rather for a group of planes, each group being called a release. In all cases, a follow-on release is started in the fabrication shop prior to completion of the previous release. For each release, the schedule shows the total number of ship sets of parts that must be produced, together with the date of completion of each order. However, although the Master Schedule provides a clear, over-all picture of the dates on which pieces must be completed, it gives no indication of the ability of the shop to produce these pieces on schedule. This can be established only by machine loading and it is the task of the Fabrication Control Department to translate the information on the Master Schedule into machine loadings for each machine in the various fabrication departments.

The first step toward establishing a proper shop load, is to make a physical survey of the number of orders that must be completed in a given release. Orders then are placed in groups based on the positions in the production line at which the parts are required.

SHOP LOAD (PIECES) FOR PIN ROUTER MACHINE


Initial load
Rescheduled load
1 15 29 14 28 11 25 9 23 6 20 4 18 1 15 29 12 26 10 24 7 21 5 19 2 16 30 13 27
FEB MAR APRIL MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB

Machine-load chart has violent fluctuations similar to shop-load curve but peaks occur at different times. Re-scheduling plan cuts off peaks by moving orders ahead to fill valleys in load curve. Heavy line shows the result—a much more even machine load

PRODUCTION CURVE

process, reduces manpower fluctuations, and avoids overdues. One man operates the plan

When a contract nears completion, or when the last release of a contract is started, there still remain a number of orders, termed "clean-up" orders, that must be added to the previously determined groups. At this point, allowance also must be made for miscellaneous orders, which are brought about by rejections and rework. Groups then are totaled to provide figures on the total shop load in terms of orders. These figures are charted to show the weekly peaks and slack periods, and the dates on which they will occur.

Overloading Is Avoided

The next step is to re-schedule a portion of the orders from peak to slack periods, always keeping in mind that any order which is re-scheduled from one group to another must always be set ahead and never behind schedule. Thus far, approximately 33% of the orders have been re-scheduled from the dates originally established by the Master Schedule.

Re-scheduling in this way insures an even flow of work into the shops at all times. However, this alone is not enough to guarantee that the schedules can be met. Although the over-all shop load may be virtually level, individual departments and machines within each department still may be loaded in a very uneven manner because the routing and operating sequence on different pieces will vary considerably. Therefore, all orders must again be sorted, first by department and then by machine. In each case, totals are computed, results are charted, and orders falling into the peak-load periods are brought forward for re-scheduling into the valleys.

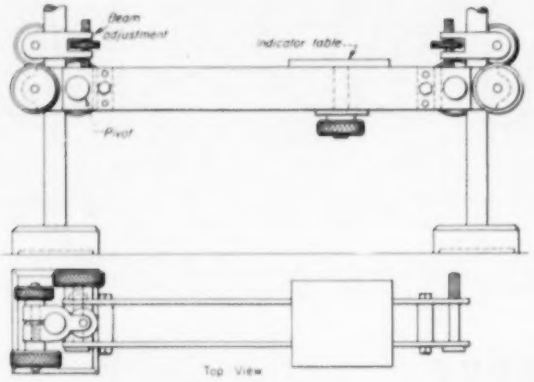
When re-secheduling, it is very important that no machines are overloaded. This is avoided by scheduling in line with individual machine capacity. Each machine has been surveyed as to average setup time, breakdown time, and average running time required for each and every piece. This gives for each machine a composite figure of pieces per day that can be produced. Orders then are converted to pieces and are re-scheduled accordingly.

The composite figure for machine capacity can be used as long as the flow of work to each machine remains approximately the same. If the nature of the jobs changes, however, a new survey must be made to adjust the capacity figure accordingly.

As new contracts are received, load charts are extended or adjusted as required. If changes are made in the Master Schedule, they are tracked down to determine their effect on loading and any necessary re-scheduling is done. Periodically, checks are made of actual vs scheduled performance.

Northrop's shop-load plan was developed by the company's Fabrication Control Department, which is a section of the Manufacturing Control Division. In addition to its other advantage, it permits accurate estimates as to the number of orders that must be completed in any one day, week, month, or any other period of time. During its life, the plan has been very successful in ironing out many of the production, storage, transportation, and manpower problems that formerly were caused by uncontrolled, fluctuating machine loads.

Practical Ideas

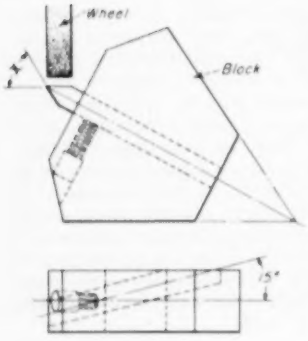


Inspection Gantry Provides High Reference Surface

WHEN EITHER CHECKING or marking off big pieces that are difficult to reach with regular inspection tools, this gantry may provide the means for getting into holes or over shoulders. It creates a stable inspection platform that is easily adjusted and flexible in height.

A dial indicator or any sort of gage can be carried on the table, which, in turn, can be moved along the main beams. It is also possible to use the gantry for marking off or checking tapers, because both ends of the main beams are pinned, which allows raising one end of the gantry above the other. Thus, it acts something like a sine bar.

The bases are heavy, and support vertical posts. Bolts and lock knobs assemble the end supports to the main beams, which are straightedges (might be ground angle iron). Bolts through the end supports lock the supports to the columns. Auxiliary collars on the columns can be clamped, and the vertical screws can be used for minute vertical adjustments by either end of the gantry. *R. H. Fry, Croydon, England.*



Setup Block Controls Threading-Tool Angles

SINGLE-POINT TOOLS for threading work are ground with this block on the table of a grinder. It controls alignment of the tools, so provides consistent results and good accuracy.

Based on a front-rake angle of 15°, the block is broached to hold $\frac{3}{8}$-in. standard toolbits at an angle corrected for rake, allowing the sides of the tools to be reground. A drilled and tapped hole that intersects the toolbit holes admits a capscrew to grip the tool firmly.

For other than 15° rake angles, new calculations can be made. The table here is based on the formula: Tangent of the block angle (from one side face to the centerline) equals tangent of half the threading angle times secant of the end-relief angle.

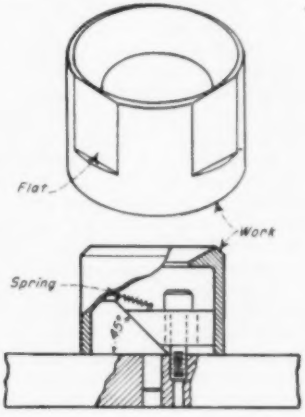
THREAD ANGLE	BLOCK ANGLE
60°	30° 52′ 0″
57½°	29° 10′ 0″
55°	28° 19′ 19″
47½°	24° 29′ 28″
29°	14° 59′ 33″

Different blocks are made for each different threading angle, and other blocks can be made for different rakes. The block is placed on the grinder table with its widest faces parallel to the wheel spindle, and the tool is ground to depth. *L. H. Coombs, Bristol, England.*

Expanding Fixture Grips Round Collars

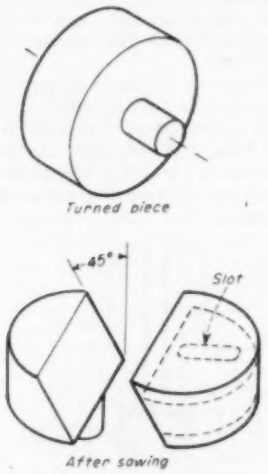
FOUR FLATS had to milled on the outside of this dished collar, and the only good way of holding it turned out to be an internal clamp. Our fixturing included a sawed-apart disk that could be tightened inside the work by means of a hex screwdriver.

A plate mounted the device. We turned the disk as shown, leaving



a stub staft extending from one end. This fitted a hole drilled through the plate. We sawed across the disk at a 45° angle to one corner of the stub shaft. This left half the disk with the shaft attached.

The other sector of the disk was milled on both sides to reduce its



thickness, and was drilled and milled to form the slot. A tapped hole in the plate admitted a hex-head screw which held the slotted sector.

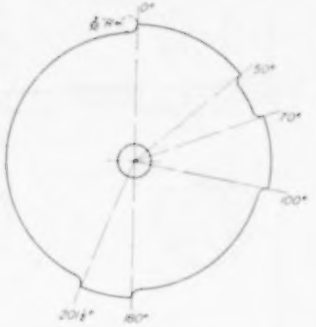
We load the fixture by pushing one edge of the work against the slotted sector (which moves it up on the other sector), then slipping it over the fixed sector. The work seats, and we tighten the screw. The work is clear on all sides, allowing us to index the plate for the four milling cuts. *N. F. Kfoury, Farmingdale, L. I.*

Wide Index-Plate Finger Compensates for Cutter Width

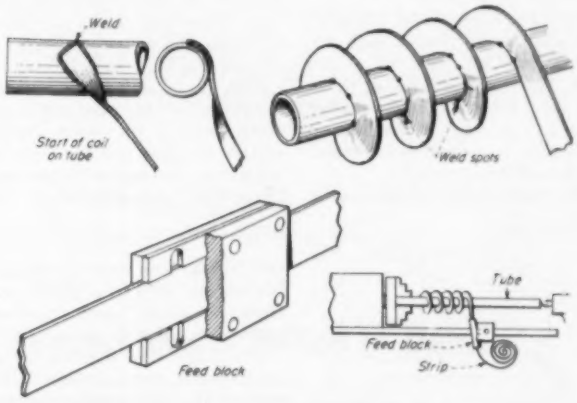
THIS PLATE cam and others like it were to be produced in small quantities, so we set up the job on the table of a vertical miller, with the work centered and clamped horizontally on an indexing plate. Unfortunately, the angles were dimensioned as shown, with no allowance made for the thickness of the cutter (an end mill). If we had indexed to the angles shown, the cuts would have been too wide.

We made a little sheet-metal strap to replace the regular pointer on the plate from this calculation: Width of strap equals the diameter of the cutter multiplied by the radius of the indexing plate (to the graduations), all divided by the diameter of the work. In this case, the result was 0.755 in.

Next, we bent the strap to the curvature of the indexing plate, and centered it where the pointer had been. A cut, for example the one from 50 to 70, was taken with the right edge of the strap on the 50 mark, where the cutter was engaged to full depth in the work. Next, the operator rotated the plate until the 70 mark was at the left edge of the strap, then he stopped.



We actually took the diameter of the end mill as its arc length, which would lead to inaccuracy; but this effect was eliminated by curving the strap. Accuracy to half a degree was held. *Robert Roedder, Wayne, Pa.*

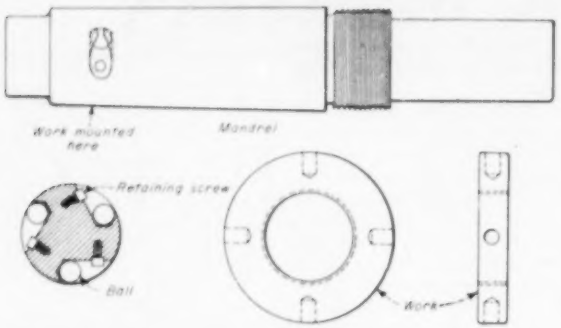


Strip-Coiling Fixture Makes Heat Exchangers

STEEL RADIATOR TUBES for heat exchangers can be made in a lathe setup that bends strip stock edgewise around the tube, which is chucked and centered. Feedscrew is engaged to make the stock follow a helix angle.

Lathe speed should be fairly slow — about 60 rpm. The stock must unreel evenly without binding. Although the strip is only tack-welded to the tube, contact (and heat conduction) is good because the compression developed during bending keeps the edge of the strip in contact with the tube.

The fixture is clamped on the compound at the helix angle. It consists of two heavy side plates and two edge plates that just clear the strip stock. The tubes for this job had 1½-in. dia, and the stock was 1 in. wide and 1/16 in. thick. *Bario Baltuch, Cambridge, Mass.*



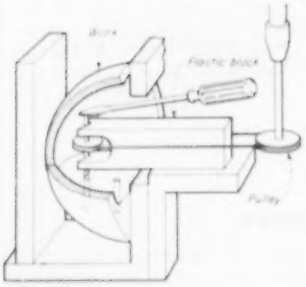
Ball Grippers Retain Work On Tapered Turning Mandrel

FOUR HUNDRED STEEL BUSHINGS with a 6-in. dia and 10-in. length were required not long ago. To divide the work between two machines, we set up to bore and face on one, then turn on the other.

When the work heated, it slipped and was forced deeper onto the tapered mandrel (the ID of the work had to be tapered at ¼ in. per ft). When it cooled, after turning was done, it was almost impossible to get off the mandrel. We had to use a press.

This was a contract job, and it looked like we would lose our collective shirt if we didn't think of something fast. The alteration illustrated did the trick. Three holes were drilled at 120° from each other at the small end of the mandrel. These were fitted with bearing balls and retaining screws to prevent the balls from falling out.

With this arrangement, any overheating allows the balls to fall outward toward the work, which retains the grip and prevents the work from moving on the mandrel. *Craig Kerr, Parkersburg, W. Va.*



Pulley Drive Drills Hidden Hole

GETTING INTO the middle of this casting to drill a blind hole out toward the edge was a problem. We licked it with a pulley-driven drill.

We picked two small pulleys to give us the desired speed of drill, and forced them onto the shanks; one on the drill, the other on a piece of round stock that we chucked in the drill spindle.

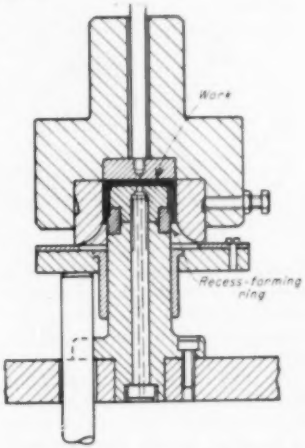
The work was blocked up on angle plates and parallels so the hole would be vertical. The drill was placed against the V-notched edges of a piece of tough plastic which was cut out to clear the pulley. Tension on the belt was maintained by locating the fixture far enough away from the spindle. The belt was fairly long so the vertical motion of the drill did not make the belt slip off the pulleys.

Feeding was done by slipping a screwdriver between the end of the drill and an overhanging section of the casting, thus forcing the drill into the work. *Charles C. Boston, Washington, D. C.*

Die Forms Recess In Drawn Steel Pot

DRAWN CUPS that we produce in large quantities had to have recesses formed around the inside edge of the lip. This was obviously a job for the automatic lathe, but too much trouble developed on this machine. The pot flexed when chucked, and the recesses never came out to the right size. Tolerances were close. The material was mild steel.

The illustrated press die was installed on a 100-ton crank press with an air-cylinder cushion. All die parts that are subject to unusual wear are readily replaceable, including the ring that forms the recess.



Die action is almost like extruding, with the shoulder of the pot being extended and thinned by the ring inserted in the die. Results are good, even at a production rate of 600 pieces per hour. *E. Springthorpe, Dudley, England.*

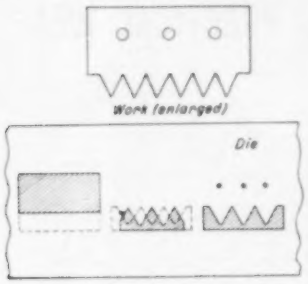
Double Blanking Forms Sharp Teeth in Press Job

WE HAD TO PRODUCE a workpiece of 0.004-in. stock with sharp teeth. This was a serious problem because making punches and dies with the teeth was difficult, even if sectionalized, and because sharpness would not last long anyway.

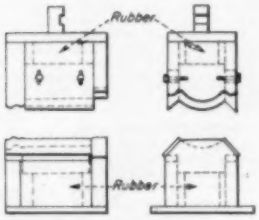
The way we did this job was to

make a double-operation die, based on punch teeth of double pitch which would overlap on the work and form the completed teeth.

Actually, the die was a three-station one where the work was



pierced at the first station and trimmed at the third. One punch cuts the roots of the teeth and the other cuts the crests. *Federico Strasser, Santiago de Chile.*



Rubber-Backed Dies Form Rocket-Fin Curves

CURVED SECTIONS that fit against the round body of the projectiles are made in rocket fins with this rubber-backed dieset.

The punch is retained in its holder by screws through slots in the holder, but the punch simply rests in its holder. Fit is fairly close for accurate matching, but it will allow both die parts to press against the hard-rubber backing without binding. Side plates are fitted on either side of the die to locate the stock.

Thousands of fins have been formed with this dieset. *T. H. Hsu, Taiwan, Formosa.*

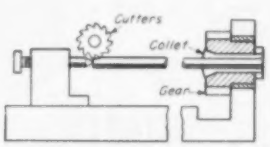
Bandsaw Storage Rack Made from 2x4's

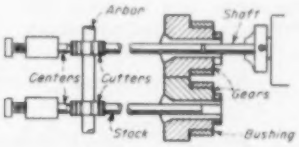
KEEPING the bandsaw area clear of junk underfoot is a full-time job in many shops. One way we found to help out was to make sure all reserve blades are neat.

A rack for new blades is made from two pieces of 2x4. These are nailed to the wall after being slotted. The slots are curved to hold the blades near their ends.

Swinging wood slats pivoted in the middle of the holders lock the blades in place to prevent them

from falling. With this rack, blades of various diameters and pitches can be arranged in an orderly fashion. *Charles Schwartz, Brooklyn, N. Y.*





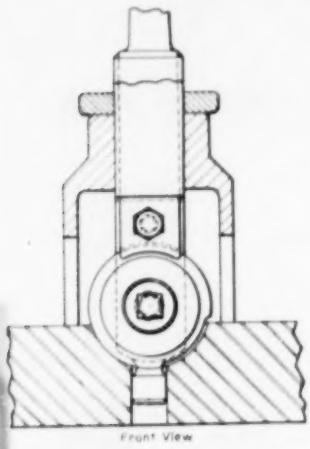
Geared Shafts Milled in Pairs

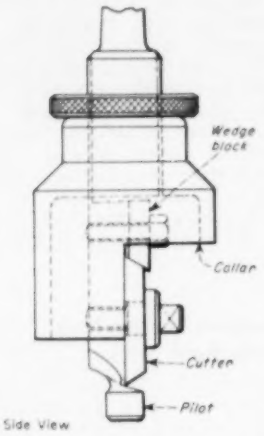
TO MILL THE ENDS of a number of shafts square, I devised this setup on the table of a horizontal milling machine. It is a sort of bench-center arrangement, with the shafts controlled by a dividing head. This insures exact rotation when the shafts are revolved 90° for the second cut. Two shafts are cut at once. With only one indexing mechanism.

The base has two holes fitted with bushings, gears, and collets. These hold the work. Bench centers at the other end of the base support the ends of the shafts which are to be milled.

A short shaft is pressed into one of the collets, and this is also gripped by a chuck fitted to the dividing head. The gears are a pair of heavy ones with large hubs and an equal number of teeth. The bushings allow rotation of the gears, which is controlled by the dividing head. Locknuts on the ends of the collets clamp the collets firmly to the gears.

The miller table is raised until the cutters reach full depth, then a second pass is taken if the cutters are not as wide as the shafts. The head is indexed for the second cut, which rotates the work and gears equally. *R. G. Vare, Christchurch, England.*



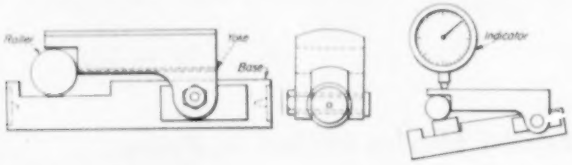


Round Cutter Machines Counterbores

WE CAN CUT ball seats and curved counterbores with this tool in a drillpress or lathe. The outside collar, which is cut away for chip clearance and so we can see cutting action, controls depth of cut, and is locked by a nut on the main shank.

The cutter is a hardened disk bolted to the cut-away main shank. The shank is equipped with a pilot that fits the hole in the work. The cutter, of course, works on the edge only, so is cut away at the opposite edge to clear the work. After wear, the cutter can be rotated to present at least one completely new edge to the work.

A wedge block attached to the shank above the cutter locks the tool in position and helps keep it steady. *W. M. Halliday, Southport, England.*



Simple Sine Bar Sets Grinding Angles

WE OFTEN HAVE wasted too much time when setting up a grinder for a tapering cut. This simple sine-bar attachment reduces guesswork during the operation.

Both ends of the sine-bar base are centered. This part is made from bar stock, so two opposite flats are milled to take the yoke of the sine bar. Another flat is milled at 90° to the first two to seat the roller.

It is important that the center of the locking pin that assembles the yoke to the base is level with the flat for the roller. The notch out of the end of the sine bar must also be carefully machined to set the top of the bar level with the centerline of the base. The top of the bar is ground off to an arc when the device is centered.

A gage block is slipped under the ball to provide for angular settings. An indicator attached to the machine head is utilized for checking the angle. *R. G. Vâře, Christchurch, England.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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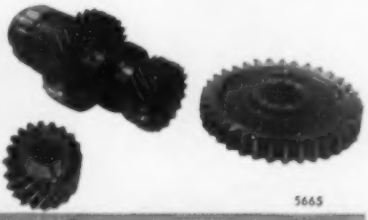

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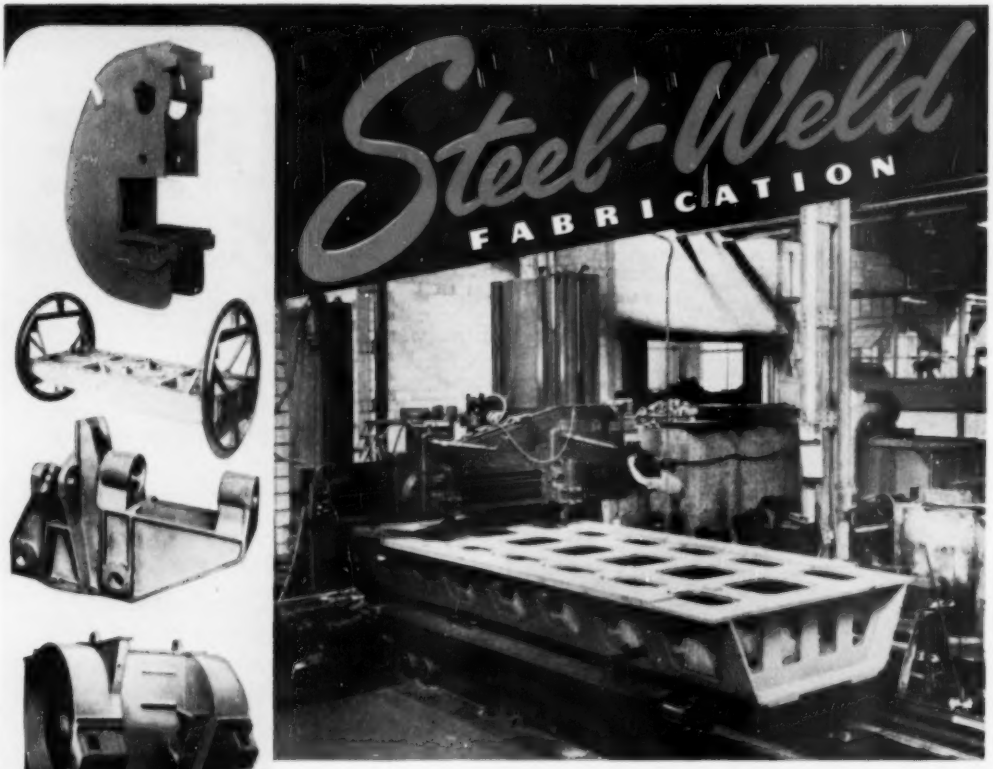

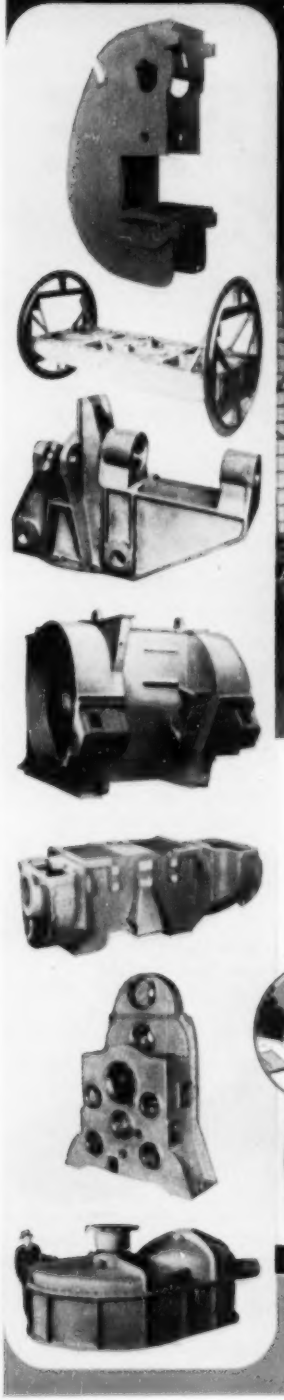

Use WELDED STEEL for Greater Strength with Less Weight!

The twenty-ton weldment above is one of many heavy fixture parts produced by Mahon for the defense production program. It, and the Steel-Weld Fabricated parts and assemblies illustrated at the left, are typical of thousands of units Steel-Weld fabricated and machined by the Mahon Company for manufacturers throughout the country. Do you have parts or assemblies in your product that could be redesigned for more economical production in welded steel? . . . do you have products in the development stage in which Steel-Weld fabricated parts could reduce weight without sacrificing strength? . . . are you faced with limited production on an item involving heavy pieces in which pattern costs are a consideration? If so, it will pay you to familiarize yourself with Mahon facilities and technical services . . . you will find in the Mahon organization a unique source with complete, modern fabricating, machining and handling equipment to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

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Pin Measurement Tables for Involute Gears...III

DIMENSION OVER PINS

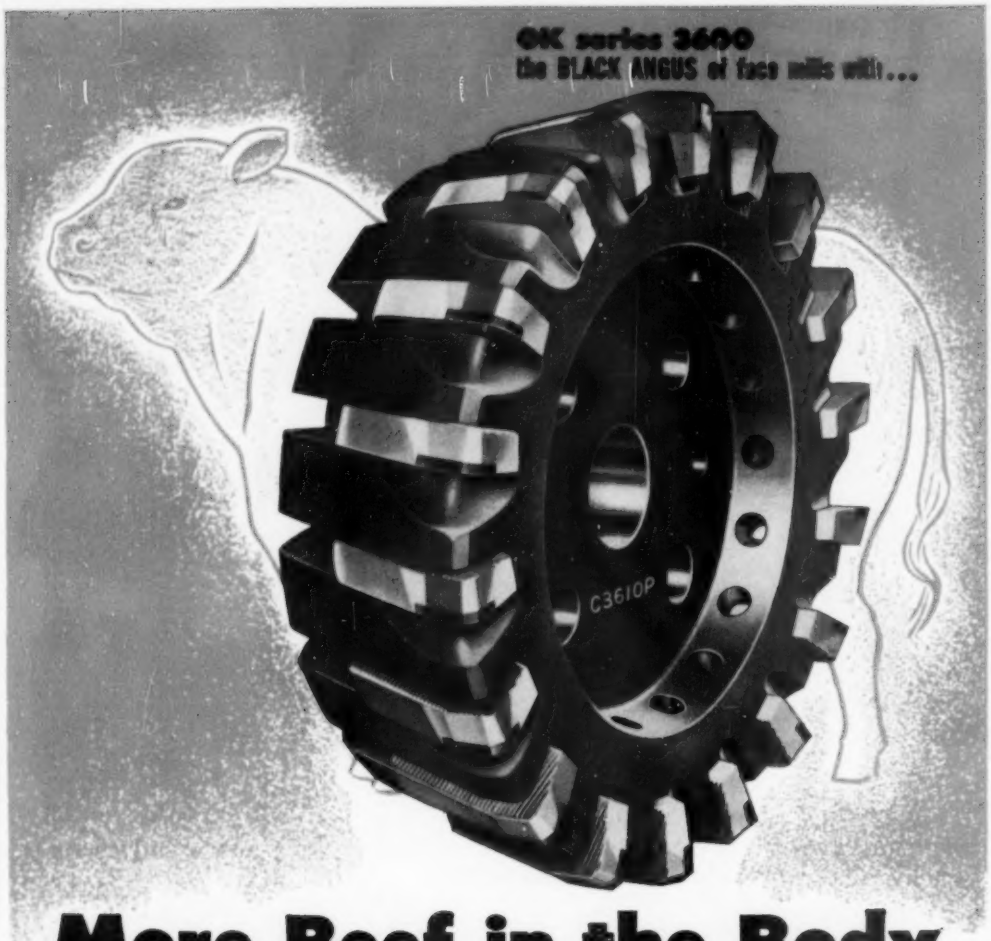
20° PA tables are used for stub teeth as well as full-depth 20° teeth. Also, calculations may not be exact in the fourth decimal place, because readings were taken from the calculating machine at that point, without interpolation.

ACTUAL PIN DIAMETER — 0.3456 5 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	2.4679	2.4689	47	9.8895	9.8801	84	17.3009	17.2884
11	2.5463	2.5466	48	10.0951	10.0855	85	17.4981	17.4855
12	2.8718	2.8715	49	10.2902	10.2806	86	17.7011	17.6885
13	3.0535	3.0527	50	10.4956	10.4858	87	17.8983	17.8857
14	3.2749	3.2736	51	10.6909	10.6810	88	18.1013	18.0886
15	3.4591	3.4574	52	10.8960	10.8860	89	18.2988	18.2859
16	3.6775	3.6753	53	11.0915	11.0814	90	18.5015	18.4887
17	3.8636	3.8610	54	11.2965	11.2863	91	18.6988	18.6860
18	4.0797	4.0768	55	11.4921	11.4818	92	18.9017	18.8888
19	4.2673	4.2640	56	11.6969	11.6865	93	19.0991	19.0862
20	4.4817	4.4780	57	11.8927	11.8822	94	19.3018	19.2889
21	4.6705	4.6664	58	12.0973	12.0867	95	19.4993	19.4863
22	4.8834	4.8790	59	12.2932	12.2825	96	19.7020	19.6889
23	5.0731	5.0684	60	12.4976	12.4868	97	19.8995	19.8864
24	5.2849	5.2799	61	12.6937	12.6828	98	20.1022	20.0890
25	5.4754	5.4702	62	12.8980	12.8870	99	20.2997	20.2865
26	5.6863	5.6807	63	13.0942	13.0831	100	20.5023	20.4891
27	5.8775	5.8717	64	13.2983	13.2872	101	20.6999	20.6867
28	6.0874	6.0814	65	13.4946	13.4834	102	20.9025	20.8892
29	6.2793	6.2730	66	13.6986	13.6873	103	21.1001	21.0868
30	6.4885	6.4820	67	13.8951	13.8837	104	21.3026	21.2892
31	6.6809	6.6742	68	14.0989	14.0875	105	21.5003	21.4869
32	6.8895	6.8826	69	14.2955	14.2839	106	21.7027	21.6893
33	7.0823	7.0752	70	14.4992	14.4878	107	21.9005	21.8870
34	7.2904	7.2831	71	14.6959	14.6842	108	22.1029	22.0893
35	7.4837	7.4763	72	14.8995	14.8878	109	22.3007	22.2871
36	7.6913	7.6835	73	15.0962	15.0844	110	22.5030	22.4894
37	7.8849	7.8769	74	15.2998	15.2879	111	22.7008	22.6872
38	8.0920	8.0839	75	15.4966	15.4846	112	22.9031	22.8895
39	8.2859	8.2777	76	15.7000	15.6880	113	23.1010	23.0873
40	8.4927	8.4843	77	15.8969	15.8848	114	23.3033	23.2895
41	8.6869	8.6784	78	16.1002	16.0881	115	23.5012	23.4874
42	8.8934	8.8846	79	16.2972	16.2850	116	23.7034	23.6896
43	9.0878	9.0790	80	16.5005	16.4882	117	23.9013	23.8875
44	9.2940	9.2850	81	16.6975	16.6852	118	24.1035	24.0896
45	9.4887	9.4796	82	16.9007	16.8883	119	24.3015	24.2876
46	9.6945	9.6853	83	17.0978	17.0854	120	24.5036	24.4897

ACTUAL PIN DIAMETER — 0.288 6 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	2.0566	2.0574	47	8.2412	8.2334	84	14.4174	14.4070
11	2.2052	2.2055	48	8.4125	8.4046	85	14.5817	14.5713
12	2.3931	2.3939	49	8.5752	8.5671	86	14.7509	14.7404
13	2.5446	2.5439	50	8.7463	8.7381	87	14.9133	14.9047
14	2.7290	2.7280	51	8.9091	8.9008	88	15.0844	15.0738
15	2.8826	2.8811	52	9.0800	9.0717	89	15.2488	15.2382
16	3.0646	3.0627	53	9.2429	9.2345	90	15.4179	15.4072
17	3.2196	3.2175	54	9.4137	9.4052	91	15.5823	15.5717
18	3.3998	3.3973	55	9.5768	9.5682	92	15.7514	15.7406
19	3.5561	3.5533	56	9.7474	9.7387	93	15.9159	15.9051
20	3.7347	3.7316	57	9.9106	9.9018	94	16.0848	16.0740
21	3.8920	3.8886	58	10.0810	10.0722	95	16.2494	16.2385
22	4.0695	4.0658	59	10.2443	10.2354	96	16.4183	16.4074
23	4.2276	4.2237	60	10.4147	10.4057	97	16.5829	16.5720
24	4.4041	4.3999	61	10.5781	10.5690	98	16.7518	16.7408
25	4.5628	4.5585	62	10.7483	10.7391	99	16.9164	16.9054
26	4.7385	4.7339	63	10.9118	10.9026	100	17.0852	17.0742
27	4.8979	4.8930	64	11.0819	11.0726	101	17.2499	17.2389
28	5.0728	5.0678	65	11.2455	11.2362	102	17.4187	17.4076
29	5.2327	5.2275	66	11.4155	11.4061	103	17.5834	17.5723
30	5.4071	5.4016	67	11.5792	11.5697	104	17.7521	17.7410
31	5.5674	5.5618	68	11.7491	11.7395	105	17.9169	17.9057
32	5.7412	5.7354	69	11.9129	11.9032	106	18.0856	18.0744
33	5.9019	5.8960	70	12.0827	12.0730	107	18.2504	18.2391
34	6.0753	6.0692	71	12.2465	12.2368	108	18.4190	18.4078
35	6.2364	6.2301	72	12.4162	12.4064	109	18.5839	18.5726
36	6.4094	6.4029	73	12.5802	12.5703	110	18.7525	18.7411
37	6.5707	6.5641	74	12.7498	12.7399	111	18.9173	18.9060
38	6.7433	6.7366	75	12.9138	12.9038	112	19.0859	19.0745
39	6.9049	6.8980	76	13.0833	13.0733	113	19.2508	19.2394
40	7.0772	7.0702	77	13.2474	13.2373	114	19.4194	19.4079
41	7.2391	7.2319	78	13.4168	13.4067	115	19.5843	19.5728
42	7.4111	7.4038	79	13.5810	13.5708	116	19.7528	19.7413
43	7.5735	7.5658	80	13.7504	13.7402	117	19.9177	19.9062
44	7.7450	7.7374	81	13.9146	13.9043	118	20.0862	20.0747
45	7.9072	7.8996	82	14.0839	14.0736	119	20.2512	20.2396
46	8.0788	8.0710	83	14.2481	14.2378	120	20.4196	20.4080



More Beef in the Body

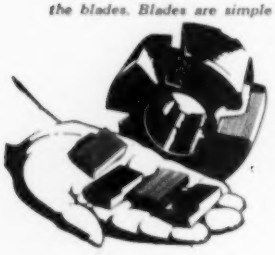
For the heaviest cuts that the biggest milling machines can pull.

OK Face Mills, size for size, have more weight, more substance, more beef in the body. And blades are huskier with a greater proportion of carbide available for cutting. It is a proven fact these cutters remove more metal in a given period than other cutters which are complicated and weakened by recesses for screws, pins, gibs or locking devices.

OK cutters consist of just two components — the body and the blades. Blades are simple wedge-shaped blocks, serrated on one face with matching serrations in the body. They are solidly seated by a driving fit, easily extracted with a drift, and stay put under the fastest speeds and heaviest feeds. The simple strength and ruggedness permit the placement of more blades in the fine pitch series and heavier blades in the coarse pitch series.*

You need the OK competitive advantages. Take your toughest job and let OK engineers have a go at it.

***The wedge is the world's simplest and strongest basic mechanical device.**



OK

modern milling cutters for modern milling machines

THE O.K. TOOL COMPANY, MILFORD, N. H.

Pin Measurement Tables for Involute Gears...IV

(BASED ON 1.728 SERIES OF PINS)

BY RALPH E RAWLING, President, RAWLING GEAR WORKS, INC, WORCESTER, MASS.

ACTUAL PIN DIAMETER — 0.2468 7 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	1.7628	1.7635	47	7.0639	7.0572	84	12.3578	12.3488
11	1.8902	1.8904	48	7.2108	7.2039	85	12.4985	12.4896
12	2.0512	2.0511	49	7.3502	7.3433	86	12.6436	12.6346
13	2.1811	2.1805	50	7.4968	7.4898	87	12.7845	12.7755
14	2.3392	2.3383	51	7.6363	7.6293	88	12.9295	12.9204
15	2.4708	2.4695	52	7.7829	7.7757	89	13.0704	13.0613
16	2.6268	2.6252	53	7.9225	7.9153	90	13.2153	13.2062
17	2.7597	2.7579	54	8.0689	8.0616	91	13.3563	13.3471
18	2.9141	2.9120	55	8.2087	8.2013	92	13.5012	13.4920
19	3.0481	3.0457	56	8.3549	8.3474	93	13.6422	13.6329
20	3.2012	3.1985	57	8.4948	8.4873	94	13.7870	13.7777
21	3.3360	3.3331	58	8.6409	8.6333	95	13.9280	13.9188
22	3.4881	3.4850	59	8.7809	8.7732	96	14.0728	14.0635
23	3.6236	3.6203	60	8.9269	8.9191	97	14.2139	14.2046
24	3.7749	3.7713	61	9.0669	9.0592	98	14.3587	14.3493
25	3.9110	3.9073	62	9.2128	9.2050	99	14.4998	14.4904
26	4.0616	4.0576	63	9.3530	9.3451	100	14.6445	14.6350
27	4.1982	4.1940	64	9.4988	9.4908	101	14.7856	14.7762
28	4.3482	4.3438	65	9.6390	9.6310	102	14.9303	14.9208
29	4.4852	4.4807	66	9.7847	9.7766	103	15.0715	15.0620
30	4.6347	4.6300	67	9.9250	9.9169	104	15.2161	15.2066
31	4.7721	4.7672	68	10.0706	10.0625	105	15.3573	15.3477
32	4.9211	4.9161	69	10.2110	10.2028	106	15.5019	15.4923
33	5.0588	5.0537	70	10.3566	10.3483	107	15.6432	15.6335
34	5.2074	5.2022	71	10.4970	10.4887	108	15.7877	15.7781
35	5.3455	5.3401	72	10.6425	10.6341	109	15.9290	15.9193
36	5.4937	5.4882	73	10.7830	10.7745	110	16.0735	16.0638
37	5.6320	5.6264	74	10.9284	10.9199	111	16.2149	16.2051
38	5.7800	5.7742	75	11.0689	11.0640	112	16.3594	16.3496
39	5.9185	5.9126	76	11.2143	11.2057	113	16.5007	16.4909
40	6.0662	6.0602	77	11.3549	11.3463	114	16.6452	16.6353
41	6.2049	6.1988	78	11.5001	11.4915	115	16.7865	16.7767
42	6.3542	6.3462	79	11.6408	11.6321	116	16.9310	16.9211
43	6.4913	6.4850	80	11.7860	11.7773	117	17.0723	17.0625
44	6.6385	6.6321	81	11.9268	11.9180	118	17.2168	17.2069
45	6.7776	6.7711	82	12.0719	12.0631	119	17.3582	17.3482
46	6.9247	6.9180	83	12.2127	12.2038	120	17.5025	17.4926

ACTUAL PIN DIAMETER — 0.216 8 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	1.5424	1.5430	47	6.1809	6.1750	84	10.8130	10.8052
11	1.6539	1.6541	48	6.3094	6.3034	85	10.9383	10.9284
12	1.7948	1.7947	49	6.4314	6.4253	86	11.0632	11.0503
13	1.9084	1.9079	50	6.5597	6.5536	87	11.1864	11.1785
14	2.0468	2.0460	51	6.6818	6.6756	88	11.3133	11.3054
15	2.1619	2.1608	52	6.8100	6.8038	89	11.4366	11.4286
16	2.2984	2.2971	53	6.9322	6.9259	90	11.5634	11.5554
17	2.4147	2.4131	54	7.0603	7.0539	91	11.6868	11.6787
18	2.5498	2.5480	55	7.1826	7.1761	92	11.8135	11.8055
19	2.6671	2.6650	56	7.3105	7.3040	93	11.9369	11.9288
20	2.8010	2.7987	57	7.4329	7.4263	94	12.0636	12.0555
21	2.9190	2.9165	58	7.5608	7.5541	95	12.1870	12.1789
22	3.0521	3.0494	59	7.6833	7.6766	96	12.3137	12.3056
23	3.1707	3.1677	60	7.8110	7.8043	97	12.4372	12.4290
24	3.3030	3.2999	61	7.9336	7.9268	98	12.5638	12.5556
25	3.4221	3.4188	62	8.0612	8.0544	99	12.6873	12.6791
26	3.5539	3.5504	63	8.1839	8.1769	100	12.8139	12.8057
27	3.6734	3.6698	64	8.3114	8.3045	101	12.9374	12.9291
28	3.8046	3.8008	65	8.4341	8.4271	102	13.0640	13.0557
29	3.9245	3.9206	66	8.5618	8.5546	103	13.1876	13.1797
30	4.0553	4.0512	67	8.6844	8.6773	104	13.3141	13.3057
31	4.1755	4.1713	68	8.8118	8.8047	105	13.4377	13.4293
32	4.3059	4.3016	69	8.9346	8.9274	106	13.5642	13.5558
33	4.4264	4.4220	70	9.0620	9.0547	107	13.6878	13.6794
34	4.5565	4.5519	71	9.1849	9.1776	108	13.8143	13.8058
35	4.6773	4.6725	72	9.3122	9.3048	109	13.9379	13.9294
36	4.8070	4.8022	73	9.4351	9.4277	110	14.0644	14.0559
37	4.9280	4.9231	74	9.5623	9.5549	111	14.1880	14.1795
38	5.0575	5.0528	75	9.6853	9.6779	112	14.3144	14.3059
39	5.1787	5.1735	76	9.8125	9.8050	113	14.4381	14.4295
40	5.3079	5.3027	77	9.9355	9.9280	114	14.5645	14.5559
41	5.4293	5.4240	78	10.0626	10.0551	115	14.6882	14.6796
42	5.5583	5.5529	79	10.1857	10.1781	116	14.8146	14.8060
43	5.6799	5.6743	80	10.3128	10.3051	117	14.9383	14.9297
44	5.8087	5.8031	81	10.4359	10.4282	118	15.0647	15.0560
45	5.9304	5.9247	82	10.5629	10.5552	119	15.1884	15.1797
46	6.0591	6.0533	83	10.6861	10.6783	120	15.3147	15.3060

If you're using high-priced quenching oils

YOU'RE PROBABLY WASTING MONEY!

Verified reports from a great many heat-treating plants prove conclusively that they have saved money by switching from an expensive quenching oil to a Sun Quenching Oil. In every instance these plants have maintained—or surpassed—their standards of quality through the use of Sun's specially refined naphthenic quenching oils.

These are facts—not idle boasts. If you would like to see field reports giving the details of these plants' quenching operations, and the benefits they obtain, fill in the coupon below.

Sun Quenching Oils can handle 95 percent of all quenching jobs

1 They cost less. You save on the purchase price.

2 They have low drag-out. When heated they thin out more than paraffinic oils, draining off parts more rapidly. You reduce your operating costs.

3 They keep systems clean. Because of their natural detergency, the tank and system stay clean. Coolers keep operating at peak efficiency.

4 They have long life. Sun Quenching Oils do not thicken up in service, and under normal operating conditions, they need never be replaced.

5 They assure a uniform rate of cooling. These oils have excellent metal-wetting characteristics. They do not lose quenching speed after extended use.

Dept. AM-7

SUN OIL COMPANY, Phila. 3, Pa.

Perhaps I *am* paying too much for quenching oil. ☐ I'd like a Sun Representative to show me field reports of other companies' experience with Sun Quenching Oils. ☐ Please send me the informative booklet "Sun Quenching Oils."

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Company_____

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SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

Pin Measurement Tables for Involute Gears...V

ACTUAL PIN DIAMETER — 0.1728 10 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	1.2339	1.2344	47	4.9447	4.9400	84	8.6504	8.6442
11	1.3231	1.3233	48	5.0475	5.0427	85	8.7490	8.7427
12	1.4359	1.4357	49	5.1451	5.1403	86	8.8505	8.8442
13	1.5267	1.5263	50	5.2478	5.2429	87	8.9491	8.9428
14	1.6374	1.6368	51	5.3454	5.3405	88	9.0506	9.0443
15	1.7295	1.7287	52	5.4480	5.4430	89	9.1493	9.1429
16	1.8387	1.8376	53	5.5457	5.5407	90	9.2507	9.2443
17	1.9318	1.9305	54	5.6482	5.6431	91	9.3494	9.3430
18	2.0398	2.0384	55	5.7460	5.7409	92	9.4508	9.4444
19	2.1336	2.1320	56	5.8484	5.8432	93	9.5495	9.5431
20	2.2408	2.2390	57	5.9463	5.9411	94	9.6509	9.6444
21	2.3352	2.3332	58	6.0486	6.0433	95	9.7496	9.7431
22	2.4417	2.4395	59	6.1466	6.1412	96	9.8510	9.8444
23	2.5365	2.5342	60	6.2488	6.2434	97	9.9497	9.9432
24	2.6424	2.6399	61	6.3468	6.3414	98	10.0511	10.0445
25	2.7377	2.7351	62	6.4490	6.4435	99	10.1498	10.1432
26	2.8431	2.8403	63	6.5471	6.5415	100	10.2511	10.2445
27	2.9387	2.9358	64	6.6491	6.6436	101	10.3499	10.3433
28	3.0437	3.0407	65	6.7473	6.7417	102	10.4512	10.4446
29	3.1396	3.1365	66	6.8493	6.8436	103	10.5500	10.5434
30	3.2442	3.2410	67	6.9475	6.9418	104	10.6513	10.6446
31	3.3404	3.3371	68	7.0494	7.0437	105	10.7501	10.7434
32	3.4447	3.4413	69	7.1477	7.1419	106	10.8513	10.8446
33	3.5411	3.5376	70	7.2496	7.2438	107	10.9502	10.9435
34	3.6452	3.6415	71	7.3479	7.3421	108	11.0514	11.0446
35	3.7418	3.7380	72	7.4497	7.4439	109	11.1503	11.1435
36	3.8456	3.8417	73	7.5481	7.5422	110	11.2515	11.2447
37	3.9424	3.9384	74	7.6499	7.6439	111	11.3504	11.3436
38	4.0460	4.0419	75	7.7483	7.7423	112	11.4515	11.4447
39	4.1429	4.1388	76	7.8500	7.8440	113	11.5505	11.5436
40	4.2463	4.2421	77	7.9484	7.9424	114	11.6516	11.6447
41	4.3434	4.3392	78	8.0501	8.0440	115	11.7506	11.7437
42	4.4467	4.4423	79	8.1485	8.1425	116	11.8517	11.8448
43	4.5439	4.5395	80	8.2502	8.2441	117	11.9506	11.9437
44	4.6470	4.6425	81	8.3487	8.3426	118	12.0517	12.0448
45	4.7443	4.7398	82	8.4503	8.4441	119	12.1507	12.1438
46	4.8472	4.8426	83	8.5489	8.5427	120	12.2518	12.2448

ACTUAL PIN DIAMETER — 0.144 12 DP 14½° and 20°PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	1.0283	1.0287	47	4.1206	4.1167	84	7.2087	7.2035
11	1.1026	1.1027	48	4.2062	4.2023	85	7.2908	7.2856
12	1.1965	1.1964	49	4.2876	4.2835	86	7.3754	7.3702
13	1.2723	1.2719	50	4.3731	4.3690	87	7.4576	7.4523
14	1.3645	1.3640	51	4.4545	4.4504	88	7.5422	7.5369
15	1.4413	1.4405	52	4.5400	4.5358	89	7.6244	7.6191
16	1.5323	1.5313	53	4.6214	4.6172	90	7.7089	7.7036
17	1.6098	1.6087	54	4.7068	4.7026	91	7.7912	7.7858
18	1.6999	1.6986	55	4.7884	4.7841	92	7.8757	7.8703
19	1.7780	1.7766	56	4.8737	4.8693	93	7.9579	7.9525
20	1.8673	1.8658	57	4.9553	4.9509	94	8.0424	8.0370
21	1.9460	1.9443	58	5.0405	5.0361	95	8.1247	8.1193
22	2.0347	2.0329	59	5.1221	5.1177	96	8.2091	8.2037
23	2.1138	2.1118	60	5.2073	5.2028	97	8.2914	8.2860
24	2.2020	2.1999	61	5.2890	5.2845	98	8.3759	8.3704
25	2.2814	2.2794	62	5.3741	5.3695	99	8.4582	8.4527
26	2.3692	2.3669	63	5.4559	5.4513	100	8.5326	8.5371
27	2.4489	2.4465	64	5.5409	5.5363	101	8.6149	8.6194
28	2.5364	2.5339	65	5.6227	5.6181	102	8.7093	8.7038
29	2.6163	2.6137	66	5.7077	5.7030	103	8.7817	8.7861
30	2.7035	2.7006	67	5.7896	5.7848	104	8.8761	8.8705
31	2.7837	2.7809	68	5.8745	5.8697	105	8.9584	8.9528
32	2.8706	2.8677	69	5.9564	5.9516	106	9.0328	9.0372
33	2.9509	2.9480	70	6.0413	6.0365	107	9.1152	9.1196
34	3.0376	3.0346	71	6.1232	6.1184	108	9.2095	9.2039
35	3.1182	3.1150	72	6.2081	6.2032	109	9.2919	9.2863
36	3.2047	3.2014	73	6.2901	6.2851	110	9.3762	9.3705
37	3.2853	3.2820	74	6.3749	6.3699	111	9.4587	9.4530
38	3.3716	3.3683	75	6.4569	6.4519	112	9.5429	9.5372
39	3.4524	3.4490	76	6.5416	6.5366	113	9.6254	9.6197
40	3.5386	3.5251	77	6.6237	6.6186	114	9.7097	9.7039
41	3.6195	3.6169	78	6.7084	6.7033	115	9.7921	9.7864
42	3.7055	3.7019	79	6.7905	6.7854	116	9.8764	9.8706
43	3.7866	3.7829	80	6.8752	6.8701	117	9.9589	9.9531
44	3.8725	3.8687	81	6.9573	6.9521	118	10.0431	10.0373
45	3.9536	3.9498	82	7.0419	7.0368	119	10.1256	10.1198
46	4.0394	4.0355	83	7.1241	7.1189	120	10.2098	10.2040

Production News

ABOUT *Lusol* — THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY • PORTLAND, CONNECTICUT

Lusol Boosted Tool Life from 2 pieces to 8

Dense smoke and the constant threat of fire forced them to abandon straight cutting oil. But production suffered with all six of the emulsions they tried, because tool life dropped to two pieces per tool grind. Then they put in a 20:1 solution of Lusol.*

All smoke disappeared and tool life jumped to eight pieces per tool grind—often higher. So they adopted Lusol for all their Warner & Swasey lathes. Finish is fine and the workers are delighted with the cleanliness Lusol has given them. Coolant costs were reduced from $.48 per gallon, plus tax, to less than $.10 per gallon with Lusol in the machines.

*Lusol is not an emulsion. It's a solution. There's a big difference.

Jet engine part of 63-24 forged steel

users say*

case histories of Lusol at work

AN ORDNANCE MAKER—"Used to get 14 pieces per set of thread chaser on our J & L lathes. Now get 150 pieces with Lusol."

A TOOL ENGINEER—"Wheels formerly lasted only two days on our Cincinnati centerless grinders. Now run a week, because of less frequent dressing required with Lusol."

AN APPLIANCE MFGR.—"No gumminess on our machines and not a sign of rust, although some parts sit around for weeks."

A STOVE BUILDER—"We're especially proud of the deep drilling and tapping we're doing with Lusol on aluminum valve bodies; 2½" deep on Kingsbury automatics."

*Users' names on request.

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 218B, Portland, Conn.

In this column,

from month to month, we hope to dissipate some of the confusion that exists in the minds of metal-working fluid users. This confusion is the result of claims and counterclaims made by those in the business of marketing cutting oils—including ourselves. To tell the truth, we are becoming pretty confused, too.

At one time our mind was fairly clear, but several recent lectures and articles on metal cutting, by young men who seem to be either nuclear scientists or out-of-this-world chemists, have left us a bit punchy. We are becoming suspicious. We wonder whether some of these boys are taking advantage of our respect for men like Einstein and are deliberately dreaming up yard-long chemical formulas and four-dimensional diagrams in order to give the ordinary engineer an inferiority complex. Perhaps the chemical fraternity has tried a little too hard to explain, with chemical reactions, phenomena that are explainable in the language of physics and tool engineering.

A recent demonstration at Thompson Products showed that a mere change of direction of any cutting fluid (and we mean any) from over to under accomplishes more than all the fooling with cutting oils during half a century. But even that doesn't slow down the theorists; someone recently even dragged in atomic energy as an influence on the cutting operation.

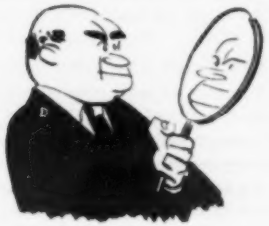
In discussing metal-working fluids, we'll cover both the water-soluble and non-water-soluble types—compounds to which water is added before use, as compared with straight oils or those diluted with mineral oils. The ideas expressed are our own and may not agree with those of this publication, our friends in the Oil Industry, or even our readers. Let's hope, however, that they start some good, healthy discussions.

As you'll recognize, we are great believers in the future of water as the ultimate in cutting fluids. We fully expect to see mineral oils, plus their additives, gradually disappear from this field. Which brings us to our first point: 1. The ability of a cutting fluid to withdraw heat from workpiece and tool, rapidly enough to maintain a constant and low temperature at the cutting edge, is the chief measure of its value. So-called lubricating qualities are secondary.

In succeeding issues, we hope to prove that only water solutions have this ability to the degree required today.

F. E. ANDERSON OIL COMPANY, PORTLAND, CONN.

TALKING SHOP



Whose Fault?

WE ASKED several works managers recently how productivity and morale were in their plants. Productivity was up — to be expected because technological improvements force up output per man even if the man himself is less inclined to produce. But they felt that the worker himself seems more inclined to work, and is therefore more cooperative, so productivity gets an added boost.

The significant thing, however, was the remark of one man: "If morale in the shop declines, we look first to ourselves. If the worker's attitude is poor, chances are more than even that it's management's fault. We look critically at ourselves, then at foreman and supervisors. Usually we find the trouble there."

More significant even was the fact that the other three executives concurred.

Low Blow

ROLLED OR FORGED alloys prove better than cast sections in low-pressure wind tunnels, says G J Maslach, supervising engr of the Institute of Engrg Research, U of Calif. Tunnel linings which oxidize or rust absorb moisture and create unfavorable test conditions; usual procedure is to clean metal surfaces throughly and coat them with low-vapor-pressure varnishes or paints.

Sawing Strap

SOLAR AIRCRAFT, San Diego, reports it has pared operating costs by replacing conventional bandsaw blades with ordinary steel strapping. Strap costs about 10 cents a blade length, compared with $3 for a saw blade.

Key to the story is of course that the strapping is actually working as a friction saw. The jobs are stainless and other high-alloy sheet and parts up to 3/16 in. thick—the same things that cut so well during World War II with "wornout" saw blades run at several times normal speeds. The strapping is SAE 1040 medium-carbon steel 0.035 in. thick and 1¼ in. wide, which of course buttwelds excellently. Solar splits the strap into two 7/10-in. and a 3/8-in. band for sawing purposes, uses it full width in fastening aircraft parts into boxcars.

However, these "toothless" blades are run at the usual bandsaw speeds of 7,550 fpm, rather than the high speeds of World War I operations, so thus far non-ferrous materials can be cut better with toothed blades. Strapping picks up, in the first few minutes of operation, a coarse or rough edge that is also hard, and which acts as a scoop to bring necessary air in to the friction surface. Tests indicate the strapping lasts more than 15 times as long as regular blades—partly because absence of the teeth avoids stress concentrations at tooth roots.

Migratory Workers

ONE New England metalworking company, in expanding its 3500-man working force by 5000, hired a total of 11,000 men. Most of its losses during the expansion period were of newly hired men — as would be expected. Studies of employee severances by many companies show that losses are primarily among "green" men, and result from inadequate or improper orientation in many cases. A little more attention initially avoids some repetitive work. . . A new small company in the same area expanded its working to three times original size in a year, has lost half its predominantly young organization to the armed forces during that period.

Return to Skill

WILLYS-OVERLAND MOTORS is among the most recent to inaugurate an apprentice program. Worked out with the Mechanics Educational Society of America in cooperation with the US Dept of Labor, the program will constitute 3½ to 4½ years in toolroom, machine shop, die shop or jig and fixture dept, running 40 hr per week including 4 hr (paid) in vocational high school an evening each week. After the first six weeks, pay automatically increases, thereafter rising again each 1000 hr.

Gummy Trepan

ANENT our Mar. 31 article, "Trepanning Speeds Production of Deep Holes," metallurgists at Bethlehem Steel Company warn that soft, gummy steel is not easily trepannable. The article mentions a 200-250 Bhn range. At least 250 Bhn has proved better at Bethlehem.

Diamond Saver

NPA ORDER N-103 forbids use of diamond grinding wheels unless a coolant is applied. It permits conventional flooding, wick application, or the newer oil mist. In tests by Alemite, kerosene mist on a 7x⅝-in. wheel extended life as much as 300%, and dressing was required after 0.050-0.080 in. of cutting, instead of 0.008-0.010 in. without it.

Alcoan Horse

ALCOA, so named in 1907, was founded in 1888 as the Pittsburgh Reduction Company. It was persistently confused with a local garbage-disposal firm — one night, very late, an official was called to the telephone and soundly berated for not removing a dead horse from an alley.

HIGH RAKE ANGLES AID MILLING PERFORMANCE

HSS cutters give better performance by using rake angles of the order of 25 to 40°. Either a higher cutting speed for the same tool life, or a longer tool life for the same cutting speed, can be secured. Workpiece finish and accuracy are improved. But greater care must be exercised in application, grinding and storage of high-rake cutters

CONCLUSIONS

From the tool-life tests and the chip formation and tool dynamometer studies, it may be concluded that the superior performance (improved tool life and surface finish) obtained with higher rakes and cutting speeds, within the limitations of these tests, is a result mainly of these basic factors:

1. Higher shear angle and correspondingly shorter path of shear.
2. Lessened cutting forces.
3. Lower value of chip-tool interface temperature.
4. Greater metal-removing efficiency and a correspondingly lower value for work done in cutting.
5. Less builtup edge, in turn causing less wear from abrasion and chipping.

The fact that, at higher cutting speeds, a maximum tool life is obtained in face milling with rake angles of 30 to 40° is a result mainly of the following factors:

1. With very low rake angles, shear angle is low, tooth forces are high, a builtup edge is present and tool-chip interface temperatures are high, though falling with increasing rake angle.
2. With very high rake angles, the tooth form is fragile, tooth forces are no longer decreasing appreciably with increasing rake, friction coefficient is high and rising rapidly, and tool-chip interface temperatures are high and rising rapidly with increasing rake angle.

Some of the advantages from the use of high-rake-angle cutters are:

1. A higher cutting speed for the same tool life is possible, or . . .
2. Longer tool life at the same cutting speed (above a certain minimum value of cutting speed) is possible.
3. Better workpiece finish is obtained because of the absence of builtup edge.
4. Less power is required for the same metal-removal rate.
5. Cutting forces are lower, consequently there is less deflection and greater accuracy.

Some inherent disadvantages, however, are:

1. More care is required in handling and storage of the cutters because of their comparatively fragile tooth form.
2. Greater care must be exercised in sharpening high-rake cutters, because there is less metal present in the tooth to dissipate the heat generated in grinding.
3. High-rake cutters do not stand up well under abrasion, and usually cannot be used for roughing or finishing cuts into scale or surfaces with abrasive inclusions. A previously machined or ground surface is best.
4. Cutting fluid used must be generous to aid in heat dissipation.
5. While the use of higher rake gives improved performance when milling SAE 1020 steel, and even when milling unhardened HSS, it is understood that with some few types of steel improved performance is not obtained in practice. Further research is needed to clarify this point.

Rake angles on the majority of HSS milling cutters vary between 5 and 15°. Too often the only justification for the use of such angles is "tradition."

Such an approach leaves many questions unanswered. For example: Could better performance be realized from the same HSS cutter by changing the rake angle? Could an increase in production be obtained with, at the same time, better finish and less power consumption?

Considerable research has been carried out on the influence of rake angles on tool life for single-point tools, especially for turning operations. The effect of cutter angles on tool life and general performance has also been well explored for the case of milling cutters tipped with sintered carbide. However, very little information has been available, until recently, regarding the influence of rake angles on tool life for milling with HSS cutters.

Among the earliest references to the advantages of increasing rake angles on HSS milling cutters to values beyond those commonly used are papers by Sinawski[1] and Frazer[2].

Presented at the Semi-Annual Meeting, American Society of Mechanical Engineers, June 15-19, 1952.

[1] "HSS, Plus High Angles, Mills Like Carbide," by Walden F Sinawski, *(AM*—April 3, 1950, p122-123.)

[2] "Raising the Limits of High-Speed-Steel Machining," by W R Frazer, *Tool Engineer*, vol 26, March 1951, p 33-37.

BY JOE H CRAWFORD, Research Engineer
and
M EUGENE MERCHANT, Assistant Director of Research
THE CINCINNATI MILLING MACHINE CO.

Both gave figures taken from numerous production jobs supporting benefits resulting from use of HSS milling cutters having rake angles higher than normal, when applied to certain operations. However, no investigation appears to have been made of the actual effect on cutter life and general performance produced by varying the rake angles of given HSS milling cutters over a wide range, under constant and controlled laboratory conditions, to determine optimum values.

An investigation was launched by authors to explore these fields. A face-milling and a slab-milling operation were chosen for study, because it was felt that these two would be representative of the majority of milling operations. In conjunction with the face- and slab-milling operations, to provide an analysis of the mechanics of cutting with higher rake angles, orthogonal cutting tests were performed with a tool dynamometer.

A range of rake angles from 0 to 50° was chosen for exploration, in conjunction with four general levels of cutting speed: 70, 160, 300 and 500 fpm. SAE 1020 hot-rolled stock, ground to remove scale, was selected because it would serve as a more common index of milling performance than some of the higher alloy steels. Tubes were also fabricated for use in the orthogonal cutting tests. A chemical-emulsion-type cutting fluid, mixed 25 to 1, was used throughout.

In the face- and slab-milling operations, studies were made on cutter life and surface finish as a function of the two variables, speed and rake angle. In the tool dynamometer tests, evaluations were made of the influence of rake angle on such basic quantities as forces, shear angle, chip friction, work done in cutting and tool-chip contact area. From these data, tool-chip interface temperature calculations were also made according to techniques developed by Trigger and Chao.[3]

The basic rake angle used as the variable in both the milling tests and the tool dynamometer tests was the "true rake." This is the angle between the tool face and a plane perpendicular to the direction of relative motion of tool and work, as measured in a plane containing this direction and perpendicular to the surface generated by the main cutting edge of the tooth or cutting tool. In the case of the milling operations, this true rake is a function of the axial and radial rake of the cutter and its corner angle. The relationship, as arrived at by Kronenberg,[4] is:

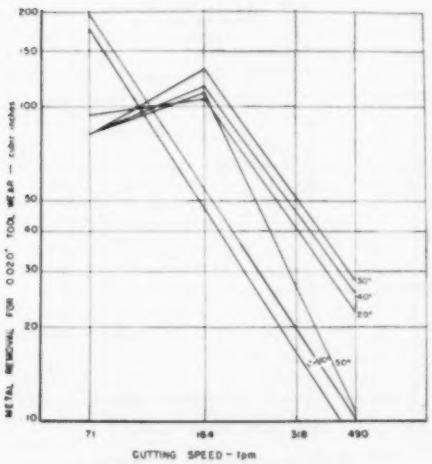
$$\tan t = \tan r \cos c + \tan a \sin c$$

where t = true rake angle of milling cutter tooth, degrees
a = axial rake angle, degrees
r = radial rake angle, degrees
c = corner angle, degrees

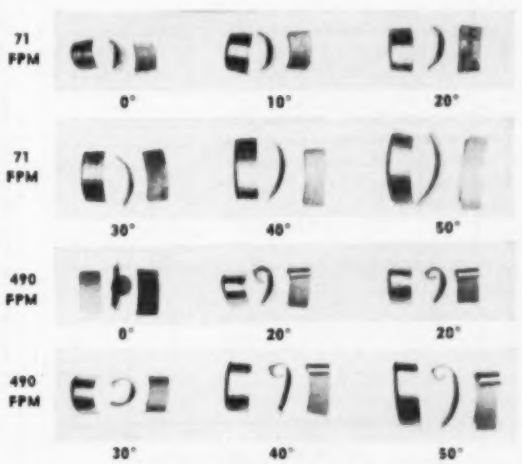
In the case of the face-milling cutter, the values of the axial rake and radial rake were made equal, and a corner angle of 45° was used, so that the main cutting edge of the cutter tooth was always perpendicular to the direction of relative motion of tooth and work (ie, 0° inclination of the cutting edge).

In the case of slab milling, the

[3] "An Analytical Evaluation of Metal Cutting Temperatures" by B T Chao and K J Trigger, *Transactions ASME*, vol 73, No. 1, 1951, p 57-68.
[4] "Cutting-Angle Relationships on Metal-Cutting Tools" by M Kronenberg, *Mechanical Engineering*, vol 65, Dec 1943, p 901-904.

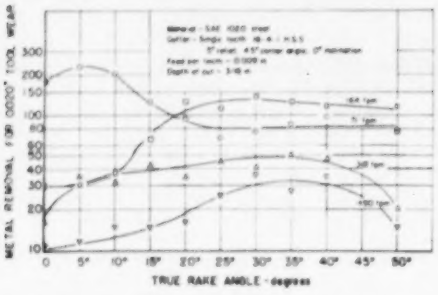


Rake angles greater than 10° promote good tool life at higher cutting speeds

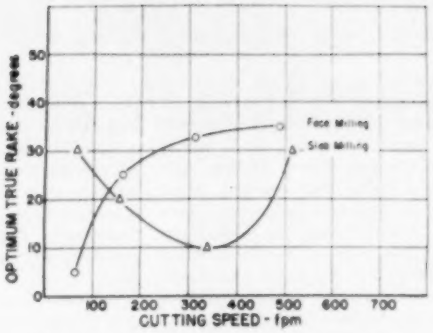


Chip deformation (a measure of force on the tooth) is reduced by increase in rake angles

PLEASE TURN PAGE



Rake angles of 30 to 40° give as good tool life at 164 fpm as 15° at 71 fpm, and the production rate at the same feed per tooth is more than doubled



Effect of cutting speed upon optimum rake was different for slab milling than for face milling, probably because of different geometry and smaller builtup edge

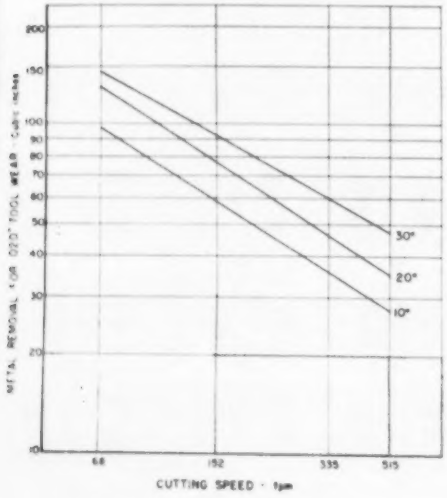
corner angle is always 0°, so the true rake is equal to the radial rake, as may be seen from the preceding equation. Thus this was so in the case of the present slab-milling cutter also, but, as it had a helix angle of 45°, the cutting edge was inclined at 45° to the direction of relative motion of tooth and work (ie, 45° inclination of the cutting edge).

Face Milling

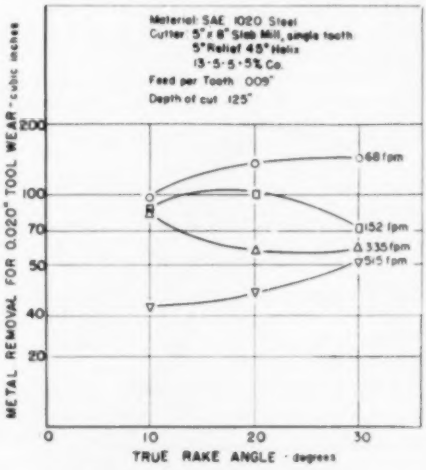
Face-milling tests were made with a single-tooth, fly-type cutter to determine the effect of rake angle on tool life. Tool geometry was: 45° corner angle, 0° inclination and 5° clearance. Axial and radial rakes were ground such that 0, 5, 10, 15, 20, 25, 30, 35, 40 and 50° true rakes resulted. Feed per tooth, 0.009 in.; 3/16-in. depth of cut. Tool life was measured in terms of the volume of metal removed to produce a wear land on the tooth flank of 0.020 in.

Tool-life curves were plotted for average values as a function of cutting speed for rakes in increments of 10°. With a 0° rake, or a conventional 10° rake cutter, tool life decreases regularly with increasing cutting speed. When larger rake angles are used, tool life at the high cutting speeds is improved, while the life at low cutting speed suffers.

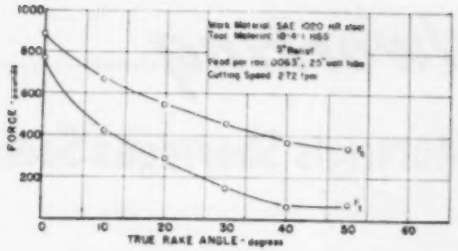
An investigation of the reason for this break in the tool life lines was made. The size of the builtup edge remaining on the chip was measured, and visual inspection was made of the chip and transient surface on the workpiece. It was found that the size of the builtup edge decreased with an increase in speed or rake. Thus, with the large builtup edge existing at low cutting speed, the fragile tooth form of high-rake-angle cutters



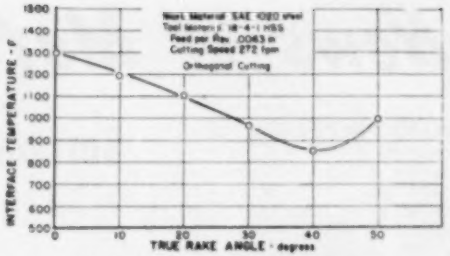
Tool life in slab milling is improved by increasing the rake angle


Material: SAE 1020 Steel
Cutter 5" x 8" Slab Mill, angle tooth
5° Relief 45° Helix
13-5-5-5% Co.
Feed per Tooth .009"
Depth of cut .125"
METAL REMOVAL FOR 0.020" TOOL WEAR - cubic inches
TRUE RAKE ANGLE - degrees
68 fpm
152 fpm
335 fpm
515 fpm

When tool life in slab milling is plotted as a function of true rake angle, it is seen that production rate is increased 110% by going from 10° rake and 68 fpm to 20° rake and 152 fpm


Work Material: SAE 1020 HR steel
Tool Material: 18-4-1 HSS
Feed per rev .0063", 25° wear lobe
Cutting Speed 272 fpm
FORCE - pounds
TRUE RAKE ANGLE - degrees

Cutting force decreases with increasing rake, becoming a minimum around 40° (orthogonal cutting)


Work Material: SAE 1020 steel
Tool Material: 18-4-1 HSS
Feed per Rev .0063 in
Cutting Speed 272 fpm
Orthogonal Cutting
INTERFACE TEMPERATURE - F
TRUE RAKE ANGLE - degrees

Calculated interface temperatures drop until the rake angle reaches 40°, and rise thereafter as rubbing effect of chip on tool increases

makes them fail rapidly (by chipping) under the action of this builtup edge, and the fragments of it pass off with the chip and work surface. This accounts for the break in the tool-life lines obtained with these high-rake-angle cutters. The stronger tooth form of the 0° and 10° rake angle cutters makes them able to stand up without chipping at low cutting speed, despite the builtup edge associated with low speed and low rake.

When tool-life data are plotted as a function of rake angle, best life with a conventional 10-15° true rake is obtained at low cutting speed. On the other hand, if a higher production rate is desired, requiring the use of higher cutting speeds, tool life will be very poor with the conventional 15° true rake. However, if at these higher speeds, the rake is increased to about 30-40°, tool life will be greatly improved. Further, the optimum true rake increases with increasing cutting speed.

Slab Milling

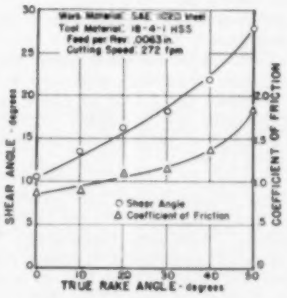
Slab-milling tests were made with a 30°-rake, 45°-helix slab mill to determine the effect of rake angle on tool life and surface finish. For better control of cutter angles and cutter-life measurements, and to keep to a minimum the amount of stock and time required for tool-life testing, only one tooth of the eight on the cutter was used. Seven teeth were ground 0.011 in. below the cutting tooth. The three rakes used, 10°, 20° and 30°, were all put on the one cutting tooth at successive positions along the cutting edge by grinding the rake face. This made it possible to cut with the three rakes simultaneously on the same cutter. Clearance angle ground on the slab-milling tooth was 5° as in the face-milling operation. Slab-milling tests were made with 0.009 in. feed per tooth and ⅛ in. depth of cut, using down milling.

An averaged plot of the observed tool life, as a function of cutting speed for the rakes used, showed that higher rake angles give better tool life. In contrast to face milling, no appreciable builtup edge was present initially, even at the low cutting speed, except in the case of the 10° rake. The cutting geometry and resulting chip formation are thus evidently more favorable than for face milling.

Profilometer measurements on the work surface showed that the 30° rake at 70 fpm gave the best surface finish, while the 20° rake was next best and the 10° rake produced the worst finish. At higher cutting speeds, surface finish was found to be independent of rake and uniformly good.

Basic investigations of the influence of rake on performance were conducted with a tool dynamometer using an orthogonal cutting arrangement. It was found that the cutting forces decrease steadily with increasing rake, due mainly to a large increase in shear angle. Although the cutting forces decrease and the shear angle increases with increasing rake, the coefficient of friction between chip and tool also increases. Furthermore, the friction coefficient increases quite rapidly with rake above about 40° and tool forces become nearly independent of rake above about 40°. These facts cast some light on the finding that the optimum values of rake, from the point of view of tool life, were found to be in the neighborhood of 30° to 40° in the face-milling tests.

An analytical study was made of tool-chip interface temperatures, using data obtained in the investigation on the mechanics of cutting, together with measurements of the apparent area of contact between chip and tool. These data were used to explore the effect of interface temperature on tool life for the range of rake angles used. Calculations were made from data obtained at a cutting speed of 272 fpm, where little or no builtup edge exists. The calculated values show that interface temperature decreases steadily with increasing rake up to a rake angle of about 40°, above which point it increases rapidly. This minimum in the temperature curve in the vicinity of 40° rake compares favorably with the maxima in the tool life curves for the higher cutting speeds, where the builtup edge is small or absent.


Work Material: SAE 1020 steel
Tool Material: 18-4-1 HSS
Feed per Rev .0063 in
Cutting Speed 272 fpm
SHEAR ANGLE - degrees
COEFFICIENT OF FRICTION
○ Shear Angle
△ Coefficient of Friction
TRUE RAKE ANGLE - degrees

Coefficient of friction between chip and tool rises rapidly above 40° rake (orthogonal cutting)

News of Metalworking

RETOOL FOR REFRIGERATORS— Hotpoint this fall will begin retooling its Cicero (Chicago) defense factory for production of refrigerators, with pilot runs scheduled for June, 1953. The plant is currently producing jet engine components for the Navy, and will continue to make jet components there, but the bulk of the 1-million sq ft of manufacturing space will go to refrigerator output.

PLANTS SEEK WORK— A total of 3500 small manufacturers will have open capacity available for defense production during the third quarter, according to NPA. Lists of the firms are being distributed to the military services and other procurement agencies.

PRODUCTION POOLS OKAYED— Three additional defense production pools have been approved by DPA for handling defense contracts and subcontracts: Metal Products Co Production Pool, Nashville, Tenn., (15 members) equipped to do defense work on electronics, radio and electronic cabinets, machine shop items, aircraft components, metal forming, and boats and barges; Consolidated Industries Defense Production Pool, Inc, New York (14 companies), equipped for foundry work, metal fabricating, welding, plating and finishing; and Engravers Production Group, New York (six firms).

Frederick S Blackall, Jr, president and treasurer of Taft-Peirce Mfg Co, nominated as 1953 president of ASME

Serious Materials Shortages Seen

WASHINGTON — The report of President Truman's Materials Policy Commission, headed by William S Paley of CBS, is loaded with forecasts about the growth of the US economy—and serves up detailed pin-pointing of some painful materials shortages that may not be very far off.

The commission figures the US economy will double in the next 25 years—and spells out what this can mean to minerals and materials supplies, to electric power needs, to research, to agriculture, construction, and all the fabricating industries.

The commission sees the need for new and expanded government programs of technical and economic research, new and expanded use of subsidies, grants and loans, new legislation. In all, the recommendation for federal action is as breathtaking as the programs of the early New Deal planners.

It's hard to say right now what immediate results can be expected from the report. But this seems certain: The Paley report will become the basis from which dozens of government-industry disputes or agreements will grow for years to come.

The commission concludes that the problem of materials shortages will become worse during the years ahead.

REQUIREMENTS—Roughly, the commission reports, the requirements of the US economy in 1975 will look something like this:

Demand for minerals will almost double;

Demand for energy in all forms—oil, coal, electricity—will double;

Demand for a host of "new and expanding raw materials" — chemicals, plastics, insecticides—may zoom many times.

Sources of supply to meet these huge requirements just aren't in sight at this time. Such key items as cobalt, chromium, magnesium, titanium and cadmium, fluorspar, copper will be short from 40% to more than 100% of demand by then.

The report — worked on for 18 months—gains weight from the inclusion of source material and information from a great many blue-chip sources outside the government.

These sources may well disagree with many of the recommendations for government action — but most would agree with the factual underpinning and the statement of the critical situation.

WON'T RUN DRY — The commission nowhere predicts that the US will someday run completely dry of key materials. Absolute shortages are not the threat; the threat of the materials problem lies in insidiously rising costs.

Over the last 50 years, real costs of materials have been declining—that is, not dollar-costs, but hours of work and amounts of capital required to bring a material into useful form. Now, the commission reports, this decline in absolute costs of materials has slowed. In fact, for some materials it has already stopped, and for others it has been reversed.

The real threat this poses is that declining productivity in raw materials production will rob the nation of the benefit of its continually rising productivity in fabricating and manufacturing.

RECOMMENDATIONS—Here is a rundown of some of the key recommendations:

Minerals — More mapping, prospecting, research on minerals discovery. New leasing policies on federal lands. Continue depletion allowances on most minerals, but no use of premium-payments to high-cost producers. Federal loans and grants to prospectors and small mining operations.

Oil-coal-electric power — Subsidize companies who undertake to produce oil from shale, perhaps by absorbing cost of hauling to markets. Federal funds to aid coal-mining and coal-use technology.

Taxes — US tax laws should be changed to encourage investment abroad.

Tariffs—Laws should permit president to remove tariff on any critical material when necessary.

in 25 Years

- Unilateral tariff reductions and tariff eliminations by the US on many industrial materials and products.
- Repeal of Buy American legislation.
- More vigorous international action to free trade, bust cartels, stabilize raw materials markets.
- More vigorous action by the International Monetary Fund to solve international currency problems.

US Buying — Permanent agency should be created to make long-term contracts with foreign suppliers, give funds to finance production abroad.

Research — Economic and technical research across the board should be stepped up with federal funds.

Stockpiling — Should be made permanent.

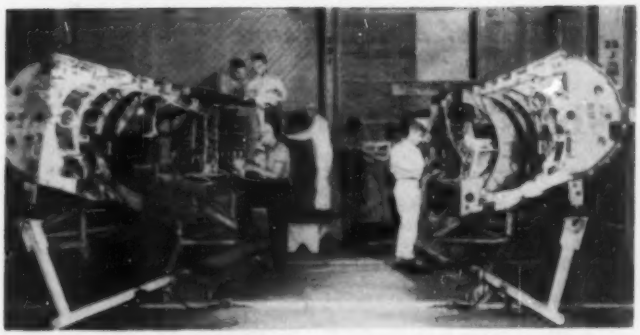
Consolidated Building Fleet of Air Force Bombardier Trainers

SAN DIEGO, Calif.—The Air Force has ordered a fleet of new T-29D twin-engine bombardier training aircraft from Consolidated Vultee.

Based on design of the T-29B, the AF's navigator trainer, the new aircraft will be equipped with many of the same instruments found in operational bombers. Latest type bomb-sight will be installed, in addition to other electronic items.

No "Planned Shortages" for Diamonds

NEW YORK — The present scarcity and high prices of diamond powder for grinding wheels has been caused by increased demand in the US and higher costs of production, and is not the result of alleged "planned shortages" by Industrial Distributors Ltd, which distributes 95% of the world's industrial diamonds. This was stated by L. H. Metzger, president of Super-Cut Inc, Chicago, who recently returned from Johannesburg where he was authorized to speak in behalf of the diamond company on this point.



"On the half shell" production line technique is used by Northrop Aircraft in assembling Scorpion F-89 all-weather interceptor at Hawthorne, Calif. Here assemblers install vital plumbing, wiring, other equipment. Later, two halves are joined in "sew up" fixtures at end of production line

Delay in Delivery of Goods Causes Drop in Government Spending for '53

WASHINGTON — The outlook for government spending in fiscal year beginning July 1 is something like $79.4 billion. That's $6 billion less than the $85.4 asked by President Truman in his January budget message. But the drop is due more to sheer inability to get previous appropriations spent for arms, than it is to any cutting by Congress.

DELIVERIES DELAYED—Three billion of the drop is due to delay in delivery of military items.

Delays in delivering goods to Mutual Security Agency accounts for around $2 billion.

The remainder is the reduction in general housekeeping of the government that will be felt in fiscal '53 as a result of Congress's economy drive.

The last-minute appropriations flurry in Congress won't have much effect on spending in fiscal '53. The major chunk of new appropriations being voted now is for equipment that the Treasury won't pay for until fiscal '54 or '55.

WAR SPENDING DOWN — Military spending is still not up to expectations. President Truman called for $50-billion next year. It is running now at $3.2 billion per month. Congressional military watchdogs think it will do well to reach $4.6 billion by the end of the fiscal year, with an average rate for the year of $4 billion per month—or $48 billion for the year. The Pentagon thinks it will be higher—averaging $4.3 billion per month, or $51.6 billion for the year.

Spending for mutual security is running behind, too. It will do well to hit $7 billion next year, against $10 billion Truman estimated.

Convair to Shift B-36 Recycling Program to Fort Worth Division

SAN DIEGO, Calif. — Final operational B-36 strategic bomber to be received from the Air Force for modernizing by Consolidated Vultee's division here will arrive in July. After delivery in mid-December, the modernization project will be continued at Convair's Fort Worth, Texas, division, where production B-36's are coming off the assembly line.

In April, 1950, the AF turned over the first of early-model B-36's to be modernized from Model B to Model D, primarily by addition of four jet engines.

Global Network Transmitters

LOS ANGELES, Calif.—$2 million worth of radio transmitters are being built for the Air Force by Westinghouse Electric Corp here. The transmitters, scheduled for July delivery, are part of a world-wide communications network for ground-to-air and ground-to-ground contact with any AF base in the world.

Units are built to send signals up to 7000 miles, and have a high frequency range of from 2000 to 30,000 kilocycles. Telegraph code signals of 500 words a minute can be transmitted on radiotelegraph channels.

What About Tito?

By EUGENE P. WARNER
Senior Vice President,
McGraw-Hill International Corp.

QUESTION MARKS surround the subject of Tito and Jugoslavia. What are their intentions? Can we depend on their army, weapons, facilities? What is the status of industry?

Mr. Warner, on a recent visit to Jugoslavia, put questions to Tito, some of which were answered, some not. A few of his impressions follow.

•

Tito's 30 divisions are his only blue chips in bargaining with the West. Weapons are another matter. For the most part, they are a hodge-podge of Russian tanks which are old but good originally, some new American General Motors trucks, some new Willys-Overland jeeps, British reconnaissance cars, some German artillery, some British antiaircraft guns, some Czech weapons and some rifles and small arms of local manufacture, with replacement parts made in the country.

In the air he has a few British Mosquitoes and a few American Thunderbolts, both now obsolescent, and a few more American jets. Eleven Jogoslavian pilots have completed jet-plane training in the US. The Navy isn't worth mentioning.

All in all, his weapons are hopelessly feeble to counter a major Russian thrust. Nonetheless, the West is betting (a small amount, judging from the quantity of equipment sent him) that he will fight if attacked.

PUSH HEAVY INDUSTRY — Tito and his Communist planners have until recently been hell-bent to build heavy industry, even if they went broke in the process. When asked if Jugoslavia is modifying its approach by de-emphasizing its plans for heavy industry, and turning more toward light industry, Tito replied:

"Jugoslavia has made no essential departures from The Plan; all she did was to somewhat restrict the scope of the build-up. For the time being heavy industry is still staying and its projects take the most room under planned construction. This, however, should not denote it will in the future. The economic blockade by the Soviet has provoked a series of difficulties, bringing increased outlays for national defense. This was one of the reasons for the modification of the plans.

"Currently under construction are cokeries at Lukavac and Zenica, their respective capacities being 225,000 and 450,000 tons of coke. Cokeries will use domestic coals. . . . Construction is in progress on hydro-electric power stations with a 171.8 mw capacity, and of thermo electric power stations with a 39.8 mw capacity, which are due to start operation after 1952."

ANOTHER SIDE TO STORY — Some of the answer is true, some wishful thinking. It is true that Russia fouled up all (Tito's) plans, and the Jugoslavs can't get the equipment and machinery they expected.

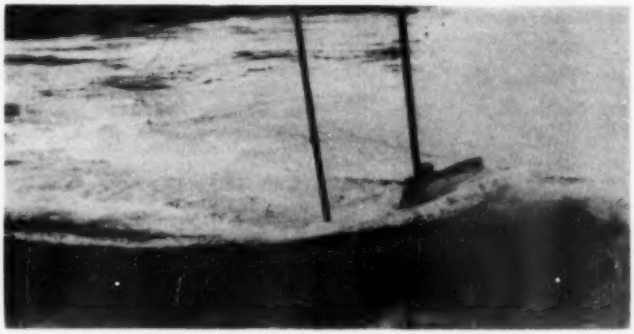
For example: Jugoslav Communists have dreamed for years of owning an aluminum plant, but all they have is a building near Zagreb, which is lacking only about $30 million of machinery. They have stepped up electrical output with 7 of 21 projected plants in operation, and have a grid to carry a lot more current, but the rest of the 21 plants seem to be slow in appearing.

The government is pouring millions into four steel plants, one at Zenica in Bosnia which it hopes will produce 500,000 tons a year, another at Jesenice, and another at Sisak, both in the North, and also a fourth smaller plant at Smedereve near Belgrade, but the coal is no good. The coking plants airily mentioned by Tito will depend on a low-grade lignite, little better than peat, and if his engineers succeed in making coke out of it, it will be the engineering miracle of the age.

PEOPLE WANT GOODS — All of this planned expansion of heavy industry in a nation of farmers leaves foreigners skeptical. They think it's over-ambitious. It leaves a lot of Jugoslavs skeptical, too. They want commercial goods, not steel plants that run without coke, and the planners are beginning to pay a little attention, if not much, to the desires of the populace.

There's some realization of the need for some light industry, with mention of a wallboard factory, a glass factory, and a porcelain factory, and similar producers of consumer goods, but it will be a hard wrench for any Communist planner to abandon his big pets for little ones. It's like asking an admirer of elephants to like rabbits.

The Jugoslav citizen, whose average wage is $13 a month, can hardly be happy with a lack of consumer goods which forces prices up to such fantastic heights as: coffee, $3.30 lb; wool dress goods, $9.30 yd; men's shirts, $4-$7.50; shoes, $20—all of a sleazy, cheap quality.



This is a truck—the new GMC 6x6 M-135, with snorkel tubes jutting out of the water at Rainbow Springs, Fla. An Army driver equipped with diving mask for deep going ran the truck completely under water while towing a 5000-lb cannon

Part of a 34-man 12-nation committee is shown in working session during three-day meeting called to develop international standards for machine tools. P. L. Houser (standing), general supervisor, Manufacturing Standards Research, International Harvester Co, Chicago, head of the 11-man American delegation in the machine-tool work, addresses the group here. The French Standard Association holds the secretariat for the machine-tool committee

US Industry Scored for Lack Of Interest in Standards

NEW YORK—American industry is called on to take a position of stronger leadership in the development of international industrial, engineering, commercial and safety standards.

Lack of such leadership is costing the country good will, according to Roger E. Gay, president, American Standards Association, who addressed 350 foreign and American delegates at the second general assembly of the International Organization for Standardization (ISO) here June 19.

Mr. Gay, who is president of Bristol Brass Co, Bristol, Conn., stated that American industry is participating in the work of only 23 of the 76 ISO technical committees.

He said, "Committeemen have asked, 'where are the Americans? America is our largest buyer, our largest seller. Will our decisions mean anything without them being here?'"

WORK ON SCREW THREADS — Progress in development of world's first international standard threads for screws was reported by ISO's Technical Committee 1, Screw Threads. The committee took up the questions of basic profile, diameter series, and diameter-pitch relation for threads in the range of diameters from 0.25 mm to 5. mm, inclusive.

The committee recommended that ISO basic profile, previously adopted for screw threads with pitches of 1 mm or larger, be used also for threads with smaller pitches, ranging from 0.075 mm to 0.8 mm (dia, 0.25 mm to 5 mm). However, the US and the United Kingdom made a reservation pending further studies of the ISO basic profile applied to the range of diameters from 0.25 to 0.9 mm, inclusive.

BEARING PROGRESS REPORTED — Agreement on boundry dimensions of most types of ball and roller bearing units and parts was reached by a committee which passed 35 resolutions on the standardization of anti-friction bearings. The ISO project seeks to standardize terminology and definitions of bearings and bearing parts; nominal dimensions and tolerances of ball and roller bearings affecting their assembly with other machine parts; methods of inspection; methods of evaluating load ratings; and dimensions of mounting accessories.

Two recommendations concerning international adoption of series of preferred numbers were approved. Preferred numbers are series of numbers, each series having a constant step up in percentage from one number to the next. The intention is that designers, in laying out a line of products whose essential characteristic (length, cubic content, or power rating) is required to increase through a given range, shall choose preferred numbers for the numerical value of that characteristic, unless there is a good reason for deviating from these numbers. This would restrict variety in a line of products to the minimum that will meet function or appearance demands of the user. At the same time, the manufacturer benefits by lower production cost.

US-USSR DISAGREE — The second plenary session of the general assembly was marked by disagreement between the American Standards Association and the Soviet Union's standards body on a US proposal to adopt standards developed by other international groups as ISO recommendations.

I. G. Kourakov, assistant chief of the Organization for Standardization of the Soviet Ministry, Moscow, stated that the proposals would impair the prestige of ISO and might lead to standardization by international organizations which are limited in scope and biased. He insisted that the appropriate ISO committee process all ISO standards before they reach the ISO secretariat in Geneva.

In reply, Admiral G. F. Hussey Jr, ASA director, who offered the proposal, declared that "the objective is to avoid using the time of the committees on work that has already been done by competent organizations."

Among other standards discussed were a world-wide standard system of tolerances and allowances between cylindrical parts, and the international unification of standards affecting the design, manufacture and use of machine tools. The US does not participate in the work of the ISO committee on machine tools, but members of the ASA's committee B5 on Small Tools & Machine Tool Elements attended the meetings as accredited observers.

SKF Director Heads ISO

NEW YORK—Dr. Hilding V. Törnebohm, vice president and technical director of SKF Industries, Göteborg, Sweden, was elected president of ISO. He succeeds Dr. Albert Caquot, French engineer, who ends his three-year term Dec 31.

William L Shank

Austin E Cole

Robert F Dick

B Walter Swanson

Names in the News

William L Shank has been elected a vice president of Ingersoll Milling Machine Co, Rockford, Ill. Mr Shank, who has been assistant to the president for the past year, was formerly works manager of the General Steel Castings Corp plant at Granite City, Ill. He had previously been assistant manager of the Homestead, Pa. armor plant of Carnegie-Illinois Steel.

B A Gustafson has been appointed vice president of Sundstrand Machine Tool Co, Rockford, Ill. Mr Gustafson, formerly manager of the Machine Tool Div, has been with the organization since 1933. **Edgar O Landstrom,** formerly manager of the Pneumatic Products Div, has been named secretary.

Paul J Foley has been appointed manager of Worthington Corp's Kansas City office. Formerly manager of the Milwaukee office, Mr Foley joined the company as a sales engineer in 1937. **William M Fine,** formerly a sales engineer in the Chicago office, will replace Mr. Foley in Milwaukee.

R L Hess, Jr, has been elected a vice president of the Rust Engrg Co. With the organization since 1937, Mr Hess was named secretary in 1946 and in 1951 was elected to the board of directors.

L A Anderson has been appointed general supt of Bethlehem Pacific's South San Francisco Steel plant, succeeding the late **W C Eshelman.** Mr Anderson has served as chief chemist and metallurgist of the plant, and in 1937 was named assistant general supt.

Austin E Cole has been elected vice president and treasurer of Illinois Tool Works, Chicago; **J B O'Connor** has been named vice president and manager of new product development, and **Robert F Dick,** vice president and assistant to the president. **Bernard H Regenburg** has been appointed secretary, and **J R Russell,** assistant secretary and treasurer.

Eugene S Page has been named special assistant to American Machine & Foundry Co's executive vice president, Arnold K Brown. Prior to joining the organization, Mr Page directed purchasing activities for the Great Lakes Carbon Corp, Chicago, for the past 13 years.

Kenneth P Denisty has been named product manager of the Caster and Truck Div, Rapids-Standard Co, Grand Rapids, Mich. Mr Denisty joined the company in 1947 and has been serving as assistant product manager for the past two years.

W Bradford Abbott, vice president, sales, of the Ohio Gear Co, Cleveland, has resigned; he had been associated with the company since 1934. **Fred C Teckmyer, Jr,** has been named vice president and general sales manager. Mr. Teckmyer's former duties as plant superintendent will be taken over by **Edward Beaumont,** and **Joseph Stich** has been named his assistant.

Frank P Joyce has been appointed works manager of the Gamewell Co, Newton Upper Falls, Mass. He was formerly factory manager of the Henry S Wright Div, Emhart Mfg Co, Hartford, Conn.

B Walter Swanson has been appointed factory manager of Hanson-Whitney Co, Hartford, Conn. He had previously served as New England manager of sales and service. **E P Cody** has been named office manager, in addition to his continued duties as general sales manager.

Hamilton Migel has been appointed to the newly-created position of second vice president in charge of engineering for the Magnaflux Corp, Chicago. Mr Migel, formerly eastern manager, will be located at the company's Chicago headquarters. **Roy O Schiebel, Jr,** formerly midwest manager, will take over the New York office; **Kermit A Skeie** will take over Mr Schiebel's duties in the Chicago sales offices.

M W Batchelor has been appointed president of Riverside Metal Co, Riverside, N. J. Mr Batchelor was formerly associated with Revere Copper & Brass Co, served as executive vice president of Bridgeport Brass Co, and manager of the Cleveland mill of Chase Brass & Copper Co.

Gale E Allen has been appointed supervisor of Trackson products promotion at Caterpillar Tractor Co, Peoria, Ill. Mr Allen, formerly domestic sales manager for the company, has been with Trackson since 1942. Prior to that he was associated with Martin-Roasa Tractor & Equipment Co, Caterpillar distributor at Cedar Rapids, Iowa.

Raymond T Fenn has been appointed chief engineer of Sterling Engrg Corp, Winsted, Conn. Mr Fenn, formerly electrical engineer at Bryant Chucking Grinder Co, will direct a new electrical and mechanical engineering consulting service for machine builders and users.

H E Chilcoat

A J Prentice

John H Biggs

John J McAleese

H E Chilcoat has been appointed general sales manager of the Townsend Co, New Brighton, Pa. Mr Chilcoat, who succeeds **Joe S Thompson,** has been assistant general sales manager since 1951, and for two years prior to that, was manager of railroad sales. He was formerly vice president in charge of sales for the Pressed Steel Car Co, Pittsburgh.

William T Powell, executive vice president of Emsco Derrick & Equipment Co, has been elected president of the firm, replacing **Hugh H Glenn,** appointed chairman of the board. A member of the firm since 1937, Mr Powell served as chief engineer in the plating division, was elected vice president in 1942, and executive vice president last year.

S E Flenner, Jr, has been appointed general sales manager of Alloy Precision Castings Co, Cleveland. Mr Flenner was formerly associated with the Methods Engineering Council, Pittsburgh, and the Koppers Co, of Pittsburgh.

Frank Heap has been appointed district manager for the Madison Products Co, Toledo, Ohio. Mr Heap, who will make his headquarters in Cincinnati, will handle that territory and the Dayton-Springfield area. For the past nine years he has been district manager in Cincinnati and Indianapolis for Monarch Machine Tool.

Fitz L Sargeant has been named regional general manager of the south central sales office, Reynolds Metals Co; he succeeds **Stuart Smith,** appointed special representative to the Army Air Force, Dayton. Mr. Sargeant joined the staff in 1941; for the past year and a half he has been industrial sales manager, eastern region, at New York.

A J Prentice has retired from active executive duty at Micromatic Hone Corp. Mr Prentice, an officer and director of the company since 1931, will continue to serve as a member of the board.

Robert W Suman has been appointed chief engineer for Link-Belt Co's new Colmar, Pa., plant, scheduled to begin operations later this year. Mr Suman has been associated with Link-Belt since 1934 in various engineering capacities, most recently as chief of the Philadelphia plant. **Norman Virkler** will succeed Mr. Suman. A member of the firm since 1917, Mr Virkler has been in charge of all enclosed drive development work since 1946.

James M Bennan, president of Jefferson Electric Co, Bellwood, Ill., has been elected chairman of the board, succeeding the late **James C Daley.** Associated with the company since 1933, Mr Bennan has served as secretary, vice president and director, and has been president since 1949. **Edward J Bennan,** formerly vice president, manufacturing, has been elected executive vice president and a member of the board.

Wilton G. Smith has been appointed district manager for the mid central territory of Hyster Co; he had formerly been manager of the company's Washington office. **Robert F. Moody** was named eastern division industrial truck sales manager; he was promoted from the post of assistant in the division.

Ezra Mosher, formerly resident engineer of National Seal Co, subsidiary of National Motor Bearing Co, Inc, Van Wert, Ohio, has been named chief research engineer of the parent company in Redwood City, Calif.

John H Biggs, formerly representative of Brown & Sharpe Mfg Co in Philadelphia, has been named to head the company's New York office, succeeding **Joseph H Skelton,** retired. **John J McAleese,** associated for many years with the Philadelphia sales organization, succeeds Mr. Biggs.

Walter L Wise, Jr, has been appointed industrial sales manager, Sperry Products, Inc, Danbury, Conn. Mr Wise, formerly sales manager of the Kingston-Conley Div, Hoover Co, Plainfield, N. J., will make his headquarters in Danbury.

C S Jacobs has been elected president of F L Jacobs Co, following the resignation of **Rex Jacobs,** who will continue to handle the company's sales program.

F R Dickenson, president of Townsend Co, New Brighton, Pa., has been elected vice president of the Industrial Fasteners Institute. Mr Dickenson joined Townsend in 1946 as executive vice president, and was elected president in 1948. Prior to that time he had been associated with American Blower Corp, Detroit.

H. A. Gardner was elected chairman of the board of Lyon Metal Products Co, Aurora, Ill., succeeding the late **Earl D. Power. H. B. Spackman,** president of the company, was elected chief executive officer, and **J. M. Olesen,** general sales manager, was appointed a vice president.

Donald C. Potts has been appointed president of the Pittsburgh Steamship Div, US Steel Co. Mr. Potts, who succeeds the late **Walter C. Hemingway,** was appointed assistant to the president in 1945, and for the past three years has been operating vice president of the division.

TOOL PRODUCTION SET—The Government of India's $17-million machine tool factory near Bangalore will go into production by August 1953, according to production Minister K. C. Reddy. Sixty machines allotted to India out of German war reparations have arrived at the factory site while orders for further plant and machinery have been placed in Europe to the value of 8-million Swiss francs, through Oerlikon of Zurich.

DUTCH TO MAKE CARS — Van Doorne's Automobilefabriek of Eindhoven will start Holland's first large-scale production of private cars by the first half of 1955. The management expects its NATO orders to run out within the next two or three years. To provide against any possible resulting slump the firm is starting work on a light, economical four-seater car. Next year the first ten test cars will begin road trials lasting one year, in which they will be tested under a wide range of conditions.

Idle Machine Tools Put to Work Under NPA Inventory Program

WASHINGTON — To achieve effective use of idle and reserve government owned production equipment, including machine tools, NPA has announced establishment of a Production Equipment Central Inventory Group (PECIG) within the Metalworking Equipment Div.

The Central Inventory Group will facilitate the screening of government-owned production equipment to defense contractors, manufacturers of machine tools and other defense-supporting industries, for use in defense production.

28,000 ITEMS LISTED — Ralph S. Howe, director of NPA's Metalworking Equipment Div, said approximately 28,000 items have been listed to date in the Central Inventory files. Many additional items are being added as reports from field surveys reach NPA.

Sixty men, loaned by the machine-tool industry for one week each month are taking inventories of idle tools in arsenals, military depots, storage centers, ordnance plants and privately-owned factories using government equipment on lease.

HOW TO GET TOOLS — NPA explained the procedure which contractors must follow to obtain production equipment through PECIG:

Military contractors must submit requests to the military contracting officer for his approval. Requests will then be forwarded to PECIG for handling by the appropriate service member.

Manufacturers in defense-supporting activities who want to obtain equipment through PECIG must submit written requests in triplicate to the NPA industry division having jurisdiction.

Applicants should include a complete description of the equipment needed, the Standard Commodity Classification Code, if available, and complete justification of the need for the equipment, NPA explained.

If the industry division endorses the applicant's request, it will be sent to the Product Distribution Branch of the Metalworking Equipment Division for approval.

FOR CURRENT WORK ONLY — NPA officials emphasized that these requests will be approved only if the equipment is needed to meet current production schedules for defense-supporting activities.

PECIG will assist the applicant in screening inventories of idle Government-owned equipment for availability of the specified items he needs, or for acceptable substitutes.

PECIG tentatively will allocate these items and make them available for on-side inspection at the request of the prospective user. The applicant must accept or reject the item within 15 days, NPA said.

As soon as the applicant notifies PECIG that he will accept the equipment, PECIG will issue shipping instructions to the Government agency concerned. Arrangements then will be made for the applicant to lease the equipment from the military agency.

New Plating Process Demonstrated at Show

CHICAGO—Nearly 10,000 industrialists and finishing specialists registered for the Industrial Finishing Exposition sponsored by the American Electroplaters' Society here June 16-19. The 130 exhibitors showed $3 million of equipment at the International Amphitheater.

Of outstanding interest at the show were two plating lines set up to demonstrate the white brass plating process, which provides a base for chromium plating used for decorative purposes. One of the demonstration lines used procedures and materials developed by Udylite Corp; the other was based on developments of Promat Div, Poor & Co.

In the Udylite process, the parts are given a light "strike" plate of copper, then are plated with white brass to a thickness of 0.0001 to 0.0002 in., using 85% zinc, 15% copper anodes and a special bath incorporating zinc cyanide and copper cyanide. Later the parts are chromium plated, then lacquered if necessary.

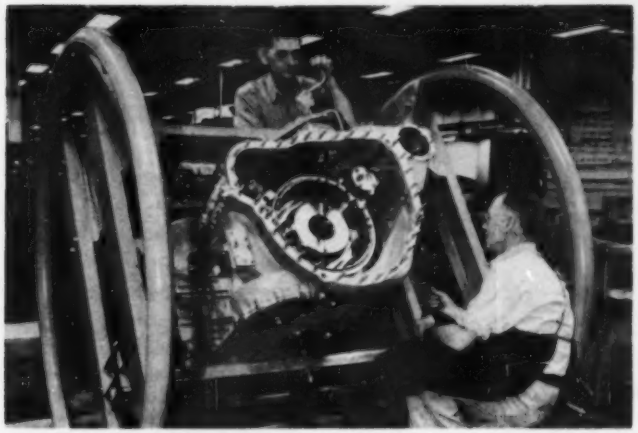
The Promat process is similar, except that zinc anodes are employed. In both cases, the parts are agitated constantly while being plated with the white brass. No special equipment is needed.

A number of new and improved products for plating, polishing and buffing operations were displayed. The Lea Mfg Co led the field with 19 such announcements.

An electronic thickness tester for determining the thickness of metallic coatings was announced by Kocour Co. This instrument operates by anodically deplating a small area of the specimen under automatically controlled conditions.

F J MacStoker, superintendent of finishing, Parrand Optical Co, Bronx, N. Y., was elected president of the American Electro-platers' Society, to suceed Cleveland F Nixon, head, Electro-Chemistry Dept Research Laboratories Div, General Motors Corp.

Other new AES offices are: first vice president, Dr George P Swift, electroplating consultant, Watertown, N. Y.; second vice president, Dr R A Scheafer, director of research, Cleveland Graphite Bronze Co; third vice president, Clyde Kelly, superintendent, Superior Plating Works, Chicago.



One of the final-assembly operations on the CD-850 cross-drive transmission for Ordnance vehicles is being done here in a special fixture at Allison. Almost 1700 machine tools are required to turn out the 400 parts required. The 3000-lb unit is contained in a compact space 30x40x53 in.

Allison to Start Production Soon On $20-Million Transmission Contract

INDIANAPOLIS—Contracts for the production of a new and larger cross-drive transmission for the Ordnance Corps are being finalized with Allison Div of General Motors, according to an announcement by E B Newill, general manager, during a ceremony here June 25 marking the delivery of Allison's 10,000th tank transmission for the Ordnance Corps.

The new contract is expected to total $20 million. Production will be started as soon as additional tools and machines can be secured.

PARTS REDUCED 30% — While the new transmission is similar in principle to present units, it will have somewhat larger capacity and the number of parts has been reduced 30%. Production schedule on current transmissions will continue and gradually increase to meet Ordnance requirements.

All three Allison transmissions are designed for a variety of vehicles. The CD-850 for example is used in the M-46 and M-47 tanks and will be used in the forthcoming heavy tank, the T-48, to be assembled by Fisher Body, Ford and Chrysler. The CD-500 is used in the T-41 tank, several personnel carriers and a twin-gun motor carriage. All three types combine braking and steering with hydraulic shifting under full load controlled by a single lever.

SUBCONTRACT TO 118 FIRMS —On the CD-850, 74% of the number of parts are subcontracted to 118 companies. On the CD-500 transmission, 68% of the number of parts are subcontracted to 117 companies. Buick is also building the CD-850 as a "shadow plant" for Allison.

Delivery of the 10,000th transmission was signalized by an employee ceremony attended by most of Allison's 5000 men working on this contract. Visitors included Indiana Governor H F Schricker; mayor Clark of Indianapolis; Maj Gen E L Ford, Chief of Ordnance; Brig Gen C H Deitrick, commanding general, Ordnance Tank-Automotive Center, and some 200 other guests.

It was brought out in discussion with executives that these transmissions are currently going to 17 Ordnance contractors and that early letting of the contract made it possible to obtain the necessary machine tools quickly, so that Allison is currently awaiting delivery on a dozen or dozen and a half tools (plus some additional ones for the new transmission) and has capacity sufficient to build at three times the present production rate.

Aircraft Industry Produced 9000 Planes Since Korea

WASHINGTON—US aircraft industry has produced between 9000 and 9500 military planes of all types since the start of the Korean War in June 1950, according to Aircraft Industries Association.

Although production approximately doubles that of the two years preceding the war, the industry could have produced an estimated 18,000 to 19,000 aircraft under the stimulus of full production. In the first five months of 1952 more military planes were turned out than were built in all of 1952; the war is being fought, however, with aircraft ordered before fighting began.

Willys-Overland Gets Contract For Electronics Equipment

TOLEDO, Ohio — Willys-Overland Motors has received a subcontract in excess of $900,000 for manufacture and assembly of military electronic equipment, production of which will take place at the company's Aircraft Div, Anderson, Ind. Contract was received from General Electric's Electronics Park at Syracuse, N. Y.

NAM Assisting Subcontractors

NEW YORK—The National Association of Manufacturers has set up a clearing house through its twelve regional offices to assist small manufacturers in obtaining contracts.

Potential subcontractors, after submitting data on machines and facilities available, will be told of prime contractors who might utilize their services.

Under the NAM plan, teams of industry executives will screen facilities information in New York and decide which prime contractors should be contacted by interested manufacturers; the regional office will then advise small firms of the name of the prime contractor to be contacted.

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Chicago Ordnance District

Tokheim Oil Tank & Pump Co. Ft. Wayne, Ind.—shells, exceeds $250,000.

Westclox Div. La Salle, Ill.—bomb fuzes, exceeds $250,000.

Brad Foote Gear Works, Inc. Cicero, Ill.—arm assy and parts, exceeds $250,000.

Metal Specialties Mfg Co. Chicago—recoil adapters, $245,100.

Diamond T Motor Car Co. Chicago—5-ton trucks and parts, exceeds $250,000.

Ekco Products Co. Chicago—cartridge cases, exceeds $250,000.

Metomic Corp. Chicago, Ill.—percussion primers, exceeds $250,000.

Borg Warner Corp. Bellwood, Ill.—metallic belt links, exceeds $250,000.

Cans, Inc. Chicago—metal ammo containers, exceeds $250,000.

A O Smith Corp. Milwaukee, Wis.—bombs, exceeds $250,000.

Frank J Curran Co. Downers Grove, Ill.—hand grenade fuzes, $224,306.

Minneapolis Moline Co. Minneapolis, Minn.—howitzers, exceeds $250,000.

Conlon Moore Corp. Joliet, Ill.—shell fins, exceeds $250,000.

Webster Electric Co. Racine, Wis.—tank traversing mechanisms, exceeds $250,000.

Eureka Williams Corp. Bloomington, Ill.—tank traversing mechanisms, exceeds $250,000.

Philadelphia Ordnance District

American Car & Foundry Co. New York—guns, self-propelled, and spare parts, exceeds $250,000.

Keystone Watch Case Div. Riverside Metal Co. Riverside, N. J.—fuzes, exceeds $250,000.

Philco Corp. Philadelphia, Pa.—fuzes, exceeds $250,000.

Rheem Mfg Co. Sparrows Point, Md.—cartridge cases, exceeds $250,000.

Rheem Mfg. Co. Burlington Ordnance Plant, Burlington, N. J.—cartridge cases, exceeds $250,000.

I. B Smith, Inc. Chambersburg, Pa.—rebuild cargo trucks, exceeds $250,000.

Warren Webster & Co. Camden, N. J.—boosters, exceeds $250,000.

York Electric & Machine Co, Inc. York, Pa.—shells, $117,250.

Birmingham (Ala.) Ordnance District

Ribbonwriter Corp. Dania, Fla.—shell fins, exceeds $250,000.

Kilby Steel Co. Anniston, Ala.—shells, exceeds $250,000.

Simmons Plating Works. Atlanta, Ga.—plating of gun tubes, exceeds $250,000.

Metal Products Corp. Miami, Fla.—fuzes, exceeds $250,000.

American Machinery Corp. Orlando, Fla.—shells, exceeds $250,000.

Rheem Mfg Corp. New Orleans, La.—shells, exceeds $250,000.

Detroit Ordnance District

Grand Rapids Hardware Co. Grand Rapids, Mich.—metal parts for boosters, exceeds $250,000.

GMC Truck & Coach Div. Pontiac, Mich.—cargo trucks, exceeds $250,000.

Stubnitz-Greene Spring Corp. Adrian, Mich.—burster casings, $157,850.

St. Louis Ordnance District

Murray Co of Texas, Dallas—shells, exceeds $250,000.

United Auto Parts. Kansas City, Mo.—rebuild of cargo trucks, exceeds $250,000.

Bowen-McLaughlin. Hitchcock, Tex.—rebuild of motor carriages, exceeds $250,000.

Los Angeles Ordnance District

Thermador Electrical Mfg Co. Los Angeles—shells, parts, exceeds $250,000.

Kwikset Locks, Inc. Anaheim, Calif.—shells, exceeds $250,000.

Price-Pfister Brass Mfg Co. Los Angeles—fuzes, parts, exceeds $250,000.

Tubing Seal Cap, Inc. San Gabriel, Calif.—percussion primers, $100,000.

Clary Multiplier Corp. San Gabriel, Calif.—boosters, exceeds $250,000.

Rochester, (N. Y.) Ordnance District

Easy Washing Machine Corp. Syracuse, N. Y. fuzes, exceeds $250,000.

Fasco Industries, Inc. Rochester, N. Y.—shells, exceeds $250,000.

Revere Copper & Brass, Inc. Rome, N. Y. shells, exceeds $250,000.

U S Hoffman Machinery Corp. New York—shells, exceeds $250,000.

H & H Mfg Co. Buffalo, N. Y.—primer screw assys for fuzes, exceeds $250,000.

Spencer Explosives Inc. Spencerport, N. Y.—electric squibs for rockets, $201,100; ignition cartridges, $138,952.

Eastman Kodak Co. Rochester, N. Y.—fuzes, exceeds $250,000.

Phoenix Electronics, Inc. Lawrence, Mass.—antennas, $196,898.

Rock Island (Ill.) Arsenal

Muehlhausen Spring Div. Standard Steel Spring Co. Logansport, Ind.—helical springs, $118,205.

Boyt Harness Co. Des Moines, Iowa—covers, guns, $129,350.

Browne & Sharpe Mfg Co. Providence, R. I.—milling machines, exceeds $250,000.

ARMY SIGNAL CORPS

Philadelphia Supply Agency

Freed Radio Corp. New York—radiacmeters, exceeds $250,000.

Radiomarine Corp of America. New York—radar sets, exceeds $250,000.

David White Co. Milwaukee, Wis.—instruments, exceeds $250,000.

Munston Mfg & Service Co, Inc. Islip, Long Island, N. Y.—maintenance parts, exceeds $250,000.

Kleinschmidt Labs, Inc. Deerfield, Ill.—teletypewriter sets, exceeds $250,000.

Collins Radio Co. Cedar Rapids, Iowa—radio receivers, $179,326.

Bomac Labs, Inc. Beverly, Mass.—electron tubes, $220,870.

Western Electric Co. New York—electron tubes, $193,830.

Radio Corp of America. Harrison, N. J.—electron tubes, $180,988.

Tung-Sol Electric Inc. Newark, N. J.—electron tubes, $153,170.

Bendix Aviation Corp. Eatontown, N. J.—$120,780.

Henry Products Co. Brooklyn, N. Y.—antenna equipment, $162,754.

Malkin-Illiom Co. Irvington, N. J.—racks, $120,696.

Machlett Labs, Inc. Springdale, Conn.—electron tubes, $131,200.

Sylvania Electric Products, Inc. New York—electron tubes, $391,512.

Raytheon Mfg Co. Waltham, Mass.—electron tubes, exceeds $250,000; radio sets, exceeds $250,000.

Radio Corp of America. Harrison, N. J.—electron tubes, exceeds $250,000.

Eitel McCullough, Inc. San Burno, Calif.—electron tubes, exceeds $250,000.

Keystone Electronics Co. Stamford, Conn.—crystal units, $171,632.

Weston Electrical Instrument Co. Newark, N. J.—electric indicating instruments, $151,000.

Phoenix Electronics, Inc. Lawrence, Mass.—antennas, $196,898.

Zenith Radio Corp. Chicago—radio sets, $175,178; radio receivers, exceeds $250,000.

Waters Conley Co. Rochester, Minn.—code practice equipment, exceeds $250,000.

Emerson Radio & Phonograph Corp. New York—radio sets, exceeds $250,000.

The new North American XFJ-2 Fury, accepted for carrier tests, is an advanced model of the Navy's first operational jet fighter, the FJ-1. The plane, which will be one of the Navy's speediest fighters, incorporates an especially-designed supersonic wing with a 35° sweepback and a hydraulically-powered "flying tail." The Fury will be armed with four 20mm cannons, has a range of 1000 miles, and a service ceiling of over 45,000 ft.

CORPS OF ENGINEERS

Chicago Procurement Office

Bay City Shovels Inc, Bay City, Mich.—cranes, truck mounted, exceeds $250,000.

Bendix Westinghouse Automotive Air Brake Co, Elyria, Ohio—spare parts, $145,358.

M-R-S Mfg Co, Flora, Miss.—tractors, exceeds $250,000.

Hercules Motors Corp, Canton, Ohio—spare parts, $199,447.

Manitowoc Engrg Works, Manitowoc, Wis.—spare parts, $118,625.

Hyatt Bearing Co, Harrison, N. J.—spare parts, $107,405.

Caterpillar Tractor Co, Peoria, Ill.—spare parts, exceeds $250,000.

Caterpillar Tractor Co, Peoria, Ill.—spare parts, exceeds $250,000.

Electric Auto-Lite Co, Toledo, Ohio—spare parts, $99,384.

Baldwin-Lima-Hamilton Corp, Lima, Ohio—spare parts, $208,841.

Bower Roller Bearing Co, Detroit—spare parts, $184,650.

Butler Mfg Co, Kansas City, Mo.—water distributors, truck mounted, exceeds $250,000.

Binks Mfg Co, Chicago—paint sprayers, exceeds $250,000.

Electric Auto Lite, Toledo, Ohio—spare parts, $127,523.

American Bosch Corp, Springfield, Mass.—spare parts, $120,719.

R G LeTourneau, Inc, Peoria, Ill.—spare parts, exceeds $250,000.

Caterpillar Tractor Co, Peoria, Ill.—spare parts, $307,491.

Little Giant Tree Feller Corp, Dallas, Tex.—spare parts, $243,294.

St. Louis (Mo.) District

Smith-Blair, Inc, San Francisco—pipe, $141,499.

Young & Greenawalt, East Chicago, Ind.—pipe, $216,300.

Wheeling Corrugating Co, Wheeling, W. Va.—pipe, exceeds $250,000.

Republic Steel Corp, Bolt & Nut Div, Cleveland, Ohio—steel carriage bolts, $105,341.

Bethlehem Steel Export Corp, New York—steel carriage bolts, $113,826.

Granite City Steel Co, Granite City, Ill.—corrugated sheet steel, exceeds $250,000.

Philadelphia District

Circle F Mfg Co, Trenton, N. J.—lamp sockets, $141,390.

Berns Mfg Corp, Chicago—floor type fans, $121,500.

U S Motors Corp, Oshkosh, Wis.—generator sets, exceeds $250,000.

Consolidated Diesel Electric Corp, Stamford, Conn.—generator sets, $174,980.

Lofstrand Co, Rockville, Md.—insect sprayers, $247,500.

Chicago Pneumatic Tool Co, Philadelphia—pumps and maintenance tools, $106,400.

John R Hollingsworth Corp, Clifton Heights, Pa.—generator sets, $146,800.

Hale Fire Pump Co, Conshohocken, Pa.—fire trailers and maintenance tools, exceeds $250,000.

Stewart-Warner Corp, Chicago—lubricators, trailer mounted, $185,453.

Magline Inc, Pinconning, Mich.—electric lighting equipment chests, exceeds $250,000.

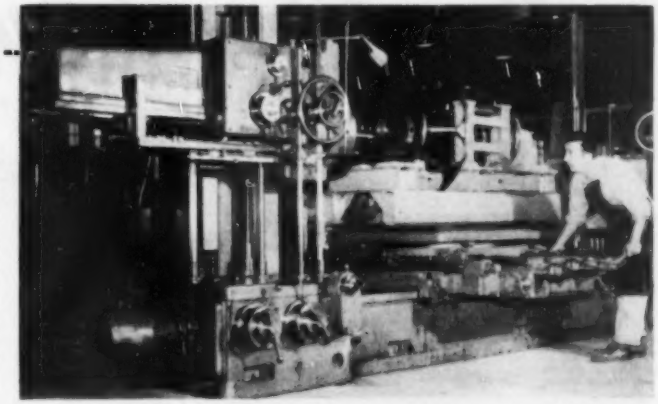
Ward LaFrance Truck Corp, Elmira, N. Y.—fire trucks and maintenance tools, exceeds $250,000.

Federal Motor Truck Co, Detroit—replenishment of motor vehicle parts, $358,356.

Airport Service Equipment Co, Westbury, L. I., N. Y.—trucks, exceeds $250,000.

American Auto-Felt Corp, Grand Rapids, Mich.—replenishment of motor vehicle parts, $239,400.

Blackstone Corp, Jamestown, N. Y.—replenishment of motor vehicle parts, exceeds $250,000.



This 5½-ton Ceruti horizontal boring mill was shipped from Italy to Solar Aircraft Co, San Diego, for use in producing J47 jet engine parts. The mill, with a 74x40 in. bed, was received on a loan from the US Air Force to use until Solar obtains machine tools now on order

NAVY AWARDS

Ships Parts Control Center, Mechanicsburgh, Pa.

Westinghouse Electric Corp, Philadelphia, Pa.—repair parts for turbines, $112,129.

Warren Steam Pump Co, Warren, Mass.—repair parts for pumps, $361,476.

Navy Bureau of Ships Awards, Washington 25, D. C.

Gunderson Brothers Engrg Corp, Portland, Ore—decks of cargo barges, exceeds $250,000.

John E Matton & Sons, Inc, Waterford, N. Y.—decks of cargo barges, exceeds $250,000.

National Steel & Shipbuilding Corp, San Diego, Calif.—64-ft steel L boats.

Marinette Marine Corp, Marinette, Wis.—decks of cargo barges, exceeds $250,000.

Graybar Electric Co, Washington, D. C.—high temp alarm switchboard thermostats, $196,381.

Yards & Docks Supply Office, Port Hueneme, Calif.

Construction Machinery Co, Waterloo, Iowa—concrete mixers, trailer mounted, 174,600.

Detroit Diesel Engine Div, GMC, Detroit—repair parts, $171,815.

AIR FORCE AWARDS

Aviation Supply Office, Philadelphia 11, Pa.

Arnot & Co, New York—clothes lockers, $407,247.

Melstrom Mfg Co, Perth Amboy, N. J.—test oscillators, $113,567.

Vickers, Inc. Div of Sperry Corp, Detroit—accumulators for aircraft, $108,927.

Aluminum Co of America, Washington, D. C.—seamless aluminum pipe, exceeds $250,000.

Westinghouse Electric Corp, Philadelphia—circuit breakers, $196,597.

Chandler Evans Div, Niles-Bement-Pond Co, West Hartford, Conn.—carburetor assys, exceeds $250,000.

Ingersoll-Rand Co, Philadelphia—portable air compressors, $128,530.

Pacific Airmotive Corp., Burbank, Calif.—regulator assys, $115,7778.

Bendix Products Div, Bendix Aviation Corp, South Bend, Ind.—wheel and brake assys, exceeds $250,000.

Air Material Command, Dayton, Ohio

New Departure Div, General Motors Corp, Bristol, Conn.—ball bearings, exceeds $250,000.

AiResearch Mfg Co, The Garrett Corp, Los Angeles—repair and overhaul parts, $109,538.

Parrell & Bauer Products Co, Detroit—machinery and equipment, $116,000.

J A Maurer, Inc, Long Island City, N. Y.—machinery and equipment, $200,000.

Armstrong Furnace Co, Columbus, Ohio—shipping containers, $100,845.

Barden Corp, Danbury, Conn.—ball bearings, $261,350.

American Machine & Metals Inc, US Gauge Div, Sellersville, Pa.—transmitters, $238,233.

R C Allen Business Machines, Inc, Grand Rapids, Mich.—indicators, $200,000.

Union Carbide & Carbon Corp (Haynes Stellite Co) Kokomo, Ind.—machinery and equipment, exceeds $250,000.

Jefferson Electric Co, Bellwood, Ill.—regulators, $235,987.

Lear, Inc, Grand Rapids, Mich.—spare parts, exceeds $250,000.

Eastern Stainless Steel Corp, Baltimore, Md.—steel sheet, exceeds $250,000.

Bendix Products Div, Bendix Aviation Corp, South Bend, Ind.—stop assy throttle, $169,723.

National Machinery Co, Tiffin, Ohio—maxipresses, exceeds $250,000.

Radio Receptor Co, Brooklyn, N. Y.—radio receivers, exceeds $250,000.

Bell Sound Systems—racks and mountings, $198,937.

Alloy Products Corp, Waukesha, Wis.—cylinder assys, $277,146.

Kollsman Instrument Corp, Elmhurst, L. I., N. Y.—indicators, exceeds $250,000.

E A Kinsey Co, Cincinnati, Ohio—grinders, $107,225.

Seeger Refrigerator Co, St. Paul, Minn.—fuel tanks, exceeds $250,000.

Cardex Corp, Chicago—maintenance parts, $110,255.

Morse Instrument Co, Hudson, Ohio—processing machines, exceeds $250,000.

Fletcher Aviation Corp, Pasadena, Calif.—fuel tanks, exceeds $250,000.

Browne & Sharpe Mfg Co, Providence, R. I.—universal tool grinders, $114,186.

Fletcher Aviation Corp, Pasadena, Calif.—fuel tanks, exceeds $250,000.

Alco-Daree Co, Chicago—steel, $219,983.

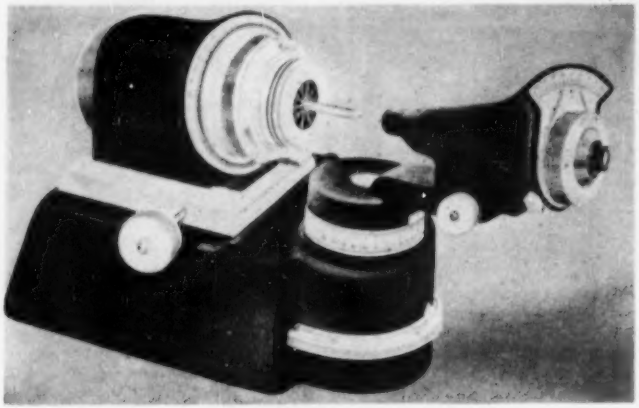
Michigan Seamless Tube Co, South Lyon, Mich.—steel, exceeds $250,000.

Northern Radio Co, New York—oscillators, exceeds $250,000.

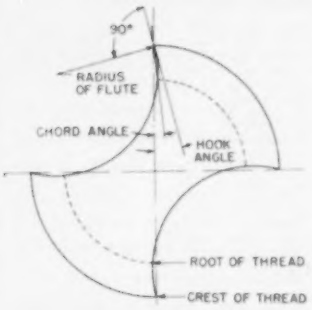
Tenser Electric Development Co, Brooklyn, N. Y.—testers, aviation ignition, $146,880.

Technical Service, Inc, Plymouth, Mich.—spare parts, $148,057.

New Shop Equipment



Tap analyzer has four main elements: 1) The head which can be traversed on ball V-ways; 2) Microscope which rotates 180°, turns about its barrel axis, and moves vertically; 3) Solid cast table that can be rotated 360° on the base; 4) Jacobs collet chuck



Common method of measuring hook is to measure the chord angle, but this varies with the pitch and flute radius, even though flute shape may be the same. The tap analyzer measures hook directly, which (if flute shape is held to a true radius in proportion to tap size) is best indication of tap cutting characteristics

Analyzer Accurately Measures Tap Hook

One of the most important measurements of a tap's effectiveness is the value of hook angle. Until the Tap Analyzer was developed there existed no accepted method for measuring hook or rake. The usual way was to measure the chordal angle between a centerline through the crest of the thread, and the chord connecting the crest with the root. Since this angle varies with the pitch and flute radius, a better method is to measure the hook directly. The analyzer does this *without the tap having to be sectioned*. It may still be used in production and, because of ease of setup, time consumed in inspection is reduced one half or less.

Construction details—The head is adjustable on accurate preloaded ball V-ways parallel to the tap axis An anti-backlash wheel drive gives extra-smooth control. The head may be rotated through 360° around its own axis. Calibrated dials permit direct reading of amount of rotation to an accuracy of 30′ of arc.

A Jacobs Rubber-Flex collet chuck assures long life and good accuracy over a range of sizes between 1/16 and 1 ⅜ in. dia tap shanks. A set of five covers all taps having shank dias up to ⅝ in. An extra set of six extends the range to 1⅝ in.

The monocular microscope is free to rotate horizontally about its own point of focus, its angular position relative to the tap axis being read off a scale. This allows viewing the tap in any vertical axis plane.

The lens system may be adjusted along its own axis by means of a backlash-free friction drive which brings any tooth into focus from the point to the end of the spiral point.

Vertical adjustment of a micrometer screw (similar to that used on a comparator) permits measurement of dia sizes and concentricity.

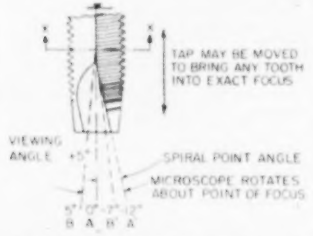
A contour-projection viewing hood (an extra attachment), may be mounted directly above the microscope body to permit the study and measurement of tooth profile on a rectangular opaque screen.

Another extra attachment provides illumination of the tap by two beams of contrasting colored light at 90° to each other.

Below is a partial list of tap elements which may be measured to the indicated tolerance:

Hook or rake angle in flute	1°
Hook or rake in spiral point	1°
Indexing of cutting edges	30′ of arc
Concentricity, threads or web	0.0005 in.
Spiral-point angle	½°
Chamfer angle	1°
Chamfer relief	0.0002 in.
Chamfer length (no. of threads)	½ thread
Thread relief	0.0002 in.
Thread form (profile projection)	½°
Flank angle	½°
Lead	0.0005 in. per in.
Comparison of surface finish	5 micro in.
Major and minor dias	0.0001 in.
Pitch dia (with measuring wire)	0.0002 in.
Web thickness	0.002 in.
Width of lands/flutes	½°

Stocker & Yale Inc, Marblehead, Mass.


TAP MAY BE MOVED TO BRING ANY TOOTH INTO EXACT FOCUS
VIEWING ANGLE
SPIRAL POINT ANGLE
MICROSCOPE ROTATES ABOUT POINT OF FOCUS
B A B A

Spiral-point angle is measured by rotating microscope to position A′ — angle is then read off microscope angle scale. With microscope scale that controls barrel tilt reading zero at point A′, the tip of the tooth is raised to coincide with horizontal centerline scribed on lens. Hook angle is then measured along spiral point by rotating microscope to B′ and reading off scale. If the hook or rake angle was measured parallel to the tap axis it would be possible to measure only one tooth. In the tap analyzer all the teeth can be measured because they are viewed at a small angle of 3° or 5°. This introduces a small error, but since the degree of readability required is only about 1°, the error is negligible

Materials and Parts

Reduced Tool-Change Time On Michigan Gear Shapers

Twelve new design features on the Series-1800 line of Shear-Speed gear shapers provide better performance, reduced tool-change time, and easier maintenance. Also, the Model 18105 with a 5-in. cutter-head stroke replaces the former 18103 which had a 3-in. maximum stroke. The design improvements are:

1) A standard adjustment ring for controlling tooth spacing with two indicators for tool setting.

2) An air cylinder in the cutter head that has a clamping flange and pilot dia. It both clamps work in the fixture and pilots moving parts in the base to insure positive alignment.

3) Coolant and lubricating pumps mounted outside base.

4) Gages and relief valves on the lubricating pump.

5) Handwheels replace ratchet mechanism to reduce time needed to remove and replace cutter head.

6) Main hydraulic cylinder that moves head has been redesigned to prevent leakage and facilitate head removal and replacement.

7) Automatic compensating taper wedges are used to lock head in cutting position instead of former eccentric bushings. Vertical adjustment of cutter head facilitated.

8) Two rest plates, one at each side of cutter head used to avoid head deflection.

9) Non-flare JIC hydraulic fittings.

10) Hydraulic control panel now meets JIC specifications.

11) JIC standard electrical control panels provided for all models.

12) Mechanical drive strengthened by using splines and square shafts throughout instead of keys.

Michigan Tool Co., 7171 E. McNichols Rd, Detroit 12, Mich.

...INCLUDING

Gear-setup equipment that allows using a surface grinder to produce highly accurate spur, helical, and involute gears in job lots or for special purposes page 188

German engine lathe with 36 spindle speeds and diagonally ribbed bed page 189

Carbide commutator saw has brazed ring forming part of the hub, making hub and blade completely bonded page 190

Oil and coolant dispensing unit has an electrically driven pump and a four-way valve to allow for pumping in or out page 192

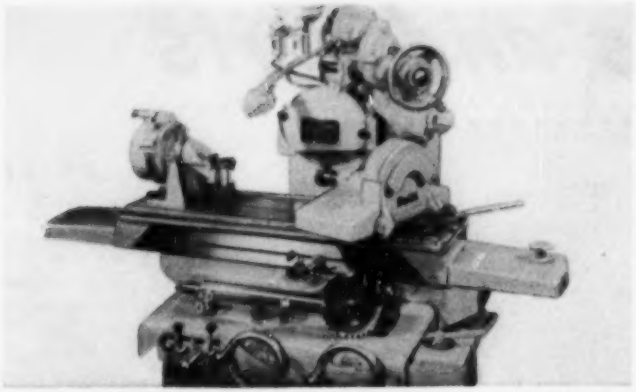
Hole-punching units that pierce the sides of drawn or bell-shaped sheet parts to eliminate expensive single-purpose cam-action punches and dies page 196

Magnetic brake, shaped like a doughnut, permits motors output shaft to extend completely through brake; both ends of shaft may be utilized page 200

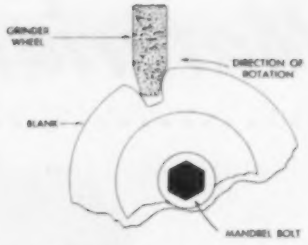
Simplified electronic welder control that takes less space, easier maintenance, and has great versatility page 204

...and in July 21

Portable parallel unit supports dies while machining guided-platen press for molding reinforced plastics



Units comprising attachment—wheel dresser at left, generating unit right—mount on surface-grinder table. Position of the generating unit on table with respect to the wheel is set with sine bar and gage blocks or a bevel protractor to assure proper angle of teeth



The involute form is generated in two operations: 1) a gashing cut in which the work is fixed and wheel grinds valley in form of basic rack tooth, and 2) blank is rotated through arc so that teeth sides bear against side of wheel, rounding these surfaces to desired involute profile

Surface-Grinder Attachment Generates Gears

Doall's universal involute-gear generator attachment is able to cut a gear without first producing master gears, cylinders, forms, racks, hobs, etc. Only standard grinding wheels are required and setups are simple.

The generator's chief use will be in producing small lots of gears that are needed in a hurry. For example, special gears required for a pilot model of a new product or a gear needed in maintenance. Work produced is claimed to be more accurate than cut gears because the blanks can be hardened before grinding. Setups for plain, straight-spur tooth or helical-involute gears from ½- to 6-in. pitch dias, DP from 2 to 100, and any pressure angle are quickly made with sine bar and gage blocks.

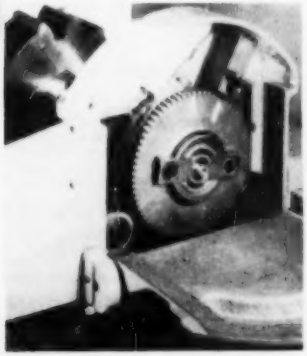
The blank, solid or precut, mounts on the mandrel of the generating unit. As the table reciprocates, the blank is fed into and away from the wheel. Before teeth are generated, however, the wheel is dressed so that the sides taper at the desired pressure angle. Any pressure angle is obtainable as the dresser diamond is adjustable from 0° to 90° in either direction. A built-in sine bar, used in conjunction with gage blocks, determines the precise angle of the dresser diamond.

The mandrel of the generating unit is mechanically linked with an indexing plate by which the blank is indexed for the desired number of teeth. Actual operating practice, where a solid blank is being used, is to "gash" the blank to approximately full depth with the wheel, using the indexing mechanism so as to establish the number and location of the teeth. The involute control mechanism is made inoperative for this operation. When the blank has been roughed-out in this fashion, the involute control mechanism is released and the blank is rolled as each tooth is ground completely to the proper contour and depth. Where larger quantities of gears are needed, time can probably be saved by having the gashing operation done on unhardened blanks with a milling cutter or some other tool.

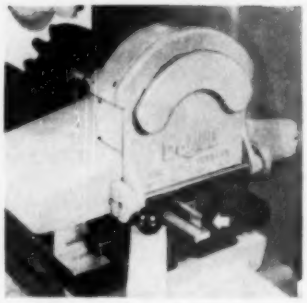
Involute curvature is obtained by rotating the blank through the proper arc as the valley between teeth is deepened. This rotation brings the working surface of the tooth to bear against the side of the wheel, thereby rounding this working surface in accordance with the desired involute curvature. Obviously, this arc must differ for gears of different diameter. The extent of this arc (degree of rotation) is quickly set with gage blocks. Virtually no calculations are required.

It is to be noted that the use of gage blocks and sine bar for all settings not only simplifies the settings but assures the generation of precision gears—precise enough to be used as master involute gears.

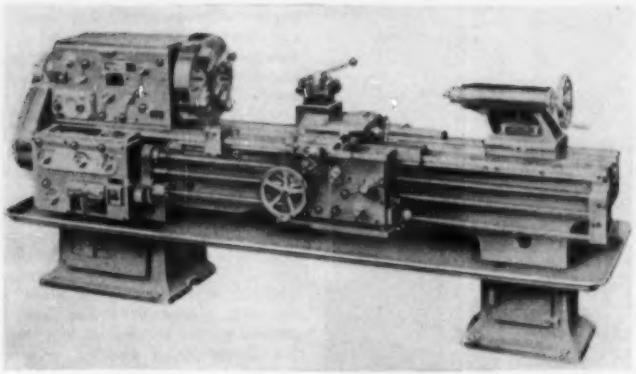
The Doall Co., 254 N Laurel Ave, Des Plaines, Ill.



Index plate lined to mandrel controls spacing and number of teeth. Extra plates are available for any number teeth to 100 Dp



Degree of rotation and sliding motion of blank govern generation of involute profile. Degree of rotation is controlled by setting of sliding bracket at rear of generator. Gage block of ½ of desired pitch dia (see arrow) is used for quick setting of bracket. Correct rotation is then obtained when arm is swung between its limits



Diagonal-Ribbed Bed, Shafts with Triangle Profile Feature Lathe

Maximum swing over bed	19½ in.
Max. swing over gap	28⅛ 23⅝ in.
Height of centers over bed	10 in.
18 spindle speeds in row 1	12 to 600 rpm
18 spindle speeds in row 2	15 to 750 rpm
Distance between centers	40, 60, 80, 100, 120 in.
Motor	7.5 hp

Engine lathe made by Weisser Heilbronn (German) has 36 spindle speeds and a rigid, sturdy construction. Its 10 most important features are:

1) Conventional hexagon spline shafts replaced by triangle-profile shafts—there can be no accidental sliding of gears during operation.

2) Lathe bed reinforced with diagonal ribs, so placed as to allow unrestricted chip flow.

3) Driving gears and sliding-gear shafts in headstock made of chrome-nickel steel, hardened and precision profile ground.

4) Extra-strong main spindle, surface hardened at bearing sections, ground and lapped, and turning in large bearings. Dia of front bearing 4x6 5/16 in., rear bearing 3⅛x5¼ in.

5) Quick-change gearbox for 177 standard metric, Whitworth, diametral pitch, American, and Modul threads; coarse threads; and multiple-thread cutting.

6) Micrometer stops for automatic tripping of longitudinal and cross slides. Apron construction is claimed to have a release accuracy of 0.0004 in. and there is no recoil of carriage at release.

7) Accidental starts prevented by safety clutch on drive shaft.

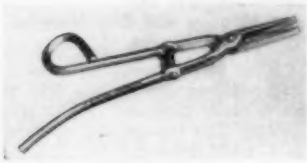
8) Honed tailstock bore with 3-in.-dia sleeve that has in. scale for boring.

9) Cross-slide extended toward rear permitting mounting of multiple holders and cut-off tools in T-slots.

10) Crossfeed screw can be adjusted backlash-free by means of special nut.

The feed-change gearbox furnishes 28 longitudinal and cross feeds each. Large graduated collars permit accurate operation of cross-slide and compound slide rest and the compound rest is equipped with a bent-tail lathe dog. Imported by:

Guthery Machine Tool Corp., 150 W 42nd St, New York 36, N. Y.



Drop-Forged Safety Tongs

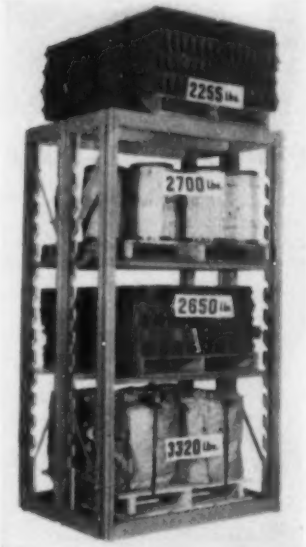
Safety tongs are made of drop-forged steel with long, broad nose members to provide a firm grip. The nose members are thin at the tip, making them useful for removing blanks from presses, selecting and removing single sheets from a pile, handling hot parts, lifting parts from solutions, etc.

By heating, the nose may be spread or reshaped as desired for handling special shapes. The tool is available with a guard over the spring for index-finger guiding.

Atlas Welding Accessories Co, 707 Lewiston St, Ferndale 20, Mich.

Bulls Eye work lamp has a specially designed reflector, controlled by fingertip manipulation of a plastic ring, which increases intensity of the bright center up to four times original brightness. Criss-crossing reflected rays minimize glare and reduce shadows; the lower-wattage standard bulb used reduces heat. Equipped with bracket base for bolting to machine or bench, table base, or universal clamp for attaching to any shape up to 3 in.

Lindly & Co., 248 Herricks Rd., Mineola, L. I., N. Y.



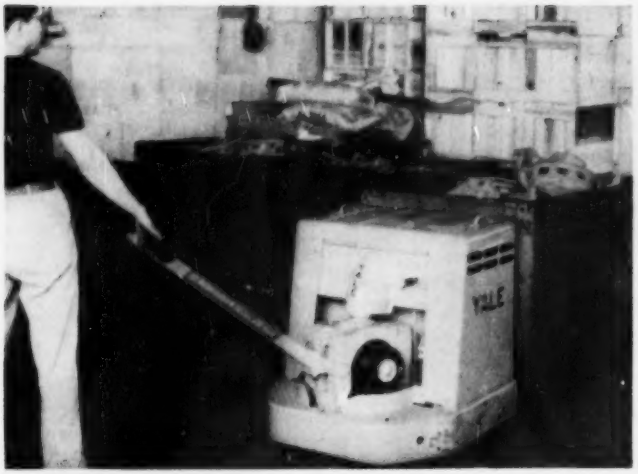
Shelf Height Easily Changed On Tailor-Made Pallet Rack

The Berger pallet rack is a tailor-made unit designed to the specifications of the user's pallets. The rack has maximum dimensions of 60x60x 120 in. and can be furnished with extra-heavy tubular supports or solid shelves.

The heavy-gage upright members are notched on 6-in. centers from 14 in. to 92 in. It takes only 30 sec for one man (without tools) to move a shelf up or down within the rack. The notches are so formed as to eliminate horizontal slipping or rolling of the tubes.

The rack will carry up to 3,000 lb per shelf and can be furnished in single-face, double-face, single-entry, or double-entry groups.

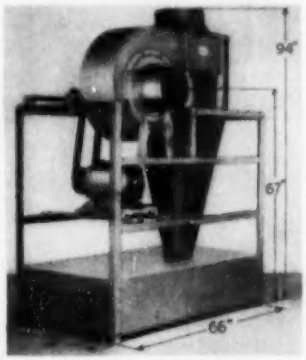
Berger Manufacturing Div, Republic Steel Corp, Canton, Ohio.



Yale Heavy-Duty Platform Truck

7,500-lb capacity Worksaver, a powered hand truck, has 11-in. high platform with 3 in. lift. 5 in. of under-clearance permit operation on ramps. Standard platform size is 42 in. long by 26½ in. wide, other sizes available.

The Yale & Towne Co, Philadelphia 15, Pa.



Large Dust Collector Requires Little Floor Space

Collector develops a rated 5500 cfm at 4 in. of water on a 12-in. inlet and yet is available from stock as a complete unit with motor driven fan, cyclone separator, and dust-storage compartment.

Known as the Model 50N60, it requires small floor space in comparison with its capacity. The area is only 38x66 in., with over-all height to the top of the sleeve of 94 in. Both inlet and outlet sleeve (12 and 16 in. respectively) are sized to fit standard sheet-metal pipe. Installation can be made without special parts as the company supplies standard hoods, branches, elbows, hose, and other fittings.

A 10-hp continuous-duty motor drives the paddle wheel, self-clearing fan through a series of V-belts. A starter switch is mounted on the frame.

Aget-Detroit Company, Ann Arbor, Mich.

Spring Toolholder Eliminates Fitting to Gage When Grinding

Spring toolholder saves time when grinding is necessary because: (1) it eliminates need for fitting to gage, (2) no adjustment in the tool post is necessary after grinding.

The toolholder permits threading close to shoulder and produces smooth, accurate threads. A wrench and special hardened HSS. cutter is furnished with the holder.

Ready Tool Co, 554 Iranistan Ave, Bridgeport, Conn.

Trainer automatically keeps wandering conveyor belts aligned and thus eliminates wear and down-time caused by creeping belts. It can be installed on any make of conveyor which has the return belt exposed beneath the bed. It can be used on fabric or rubber-covered belts 3/16 in. or more thick, operating at speeds up to 200 fpm. The trainer is bolted to flanged rails on the underside with the flat sides of the belt running between two sets of knurled, spring-loaded rollers. Belt edges contact two sets of equalizer posts. If the belt creeps to either side it presses against these posts and cocks the spring-loaded knurled rolls to the new belt direction.

The Rapids-Standard Co., Inc., Dept. BT, 342 Rapistan Bldg. Grand Rapids 2, Mich.

Carbide Commutator Saw

Principal design feature of this saw is a brazed ring which forms a part of the hub, making hub and solid carbide blade completely bonded and rigid. The tool is designed primarily for commutator undercutting, but can be used on other slitting and slotting work as well.

Dias range up to 3 in. Hubless saws with ¼-in. dia are also manufactured by the company, in addition to the carbide-tipped Thinsaw with circular tip seat which can be held to 0.030-in. thickness, in dias up to 5 in.

Gay-Lee Co., Clawson, Mich.

Main Conveyor Belt For Abrasive and Oily Material

Made in either of two duck weights, 37½ or 39 oz, Armadillo is an oil buff, stitched canvas belt with an extra-hard, glass-like, yet flexible coating. This coating both sheds oil and resists abrasion.

Uses include: conveying oily steel scrap, steel tote pans, steel stampings with sharp edges, cut glass, etc.

Main Belting Co., 1241 Carpenter St, Philadelphia 47, Pa

The trend is to more forgings with **BLISS** *Presses*

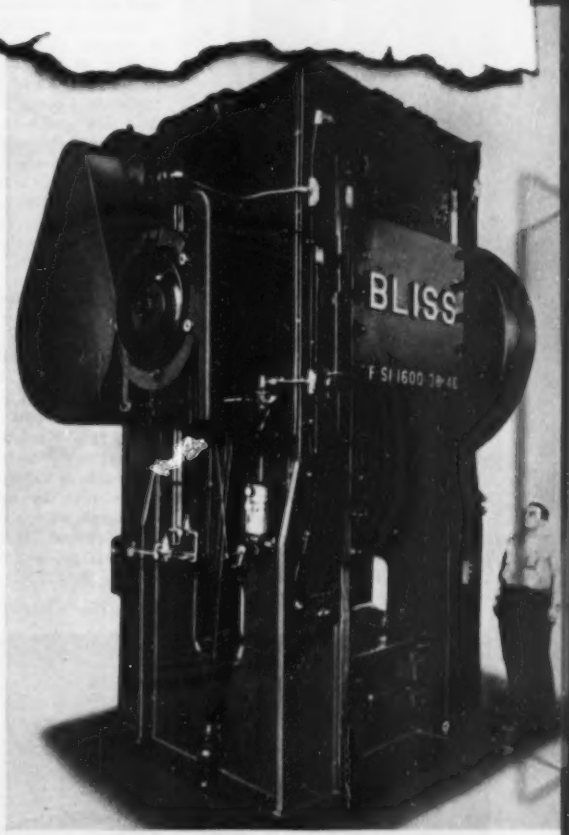
Here are the "Plus" Features of the New Bliss Forging Press:

Easily adjusted die seat: The wedge-type die seat permits easy, positive adjustment.

Withstands severe usage: A specially-designed Bliss heavy-duty air friction clutch and an air release spring brake, both mounted on a full eccentric main shaft, permit fast press speeds on 'round-the-clock production runs.

Die alignment maintained even when off-center loads are applied, because front of slide has long, continuous gib ways extending up into crown.

For complete information on the new Bliss line of High-Speed Forging Presses, write for Catalog 42.



New Bliss Forging Press for high production to be built in a wide range of sizes with capacities up to 4,000 tons.

BLISS

ON YOUR PRESS IS MORE THAN A NAME...IT'S A GUARANTEE!

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch Offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, and Toronto, Canada. **West Coast Representatives:** Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States and cities throughout the world.

Abbeon Industrial Dehumidifier Features Automatic Control

This dehumidifier can be supplied in three different ways:

1) Continuous or intermittent operation without automatic control —in this case to install the unit all that is necessary is to plug it into a 110-v ac electric outlet, and when sufficient moisture has been removed from the air, snap switch to off position.

2) With an optional plug-in control for automatic operation. All that needs to be done is plug the unit into the control, plug control into outlet, and set dial at percentage humidity desired.

3) The unit is also available with the control built right into the front as a permanent part, and in this case it is just necessary to plug into wall and set for automatic operation.

Operation is as follows: Room air is drawn into the unit by a fan located at the top. The air then passes over cold coils where the moisture is deposited. Water gathers in a pan which can be emptied by hand. A fixture is provided in the bottom of the unit for attaching a hose or pipe to lead to a drain, thus dispensing with the pan entirely.

Abbeon Supply Co., 179-15 Jamaica Ave., Jamaica, N. Y.

High-speed copying machine has a 46-in. printing width to handle standard 42-in. roll stock or insertion of multiple cut sheets of copying paper. Its 48-in., 2,000-watt Vycor mercury arc lamp speeds printing up to a maximum of 12 linear fpm. Known as the Model 30 it requires no installation, just a connection to a 230-v, 60-cycle ac line. Copies may be made on Copyflex sensitized paper, acetate-coated paper, film, and cloth.

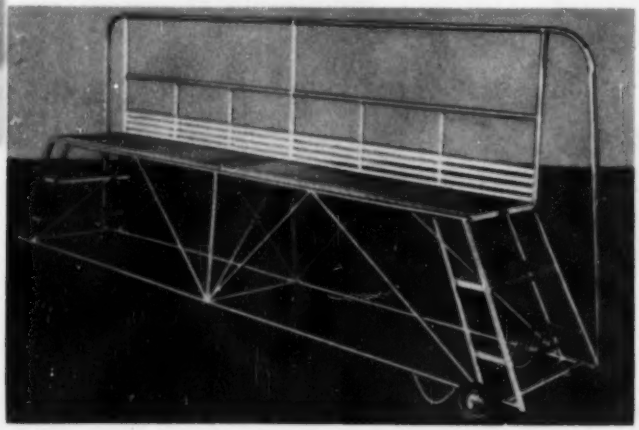
Charles Bruning Company, Inc., Teterboro, N. J.

Table Belt Conveyor

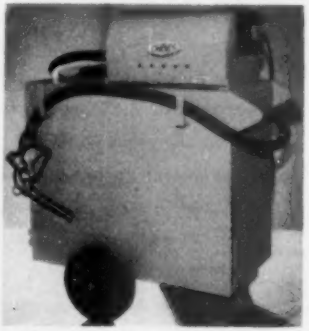
Table conveyor has a 12-in.-wide belt but it can be made to any length or width. A variable-speed drive runs the belt at a normal 20 fpm with a maximum of 40 fpm.

Belt can be white neoprene, stitched or woven canvas, or rubber, depending on its use. Size of the motor depends on length of the belt and material being handled. A 15-in. maple table is constructed on each side of the traveling belt. It can also be made of masonite or metal. Adjustable legs on the conveyor enable it to be set at any suitable height.

Flexoid Conveyor Co., 1543 E. 23rd St, Cleveland 14, Ohio.



PORTABLE PLATFORM for assembling large machinery and machine tools, army tank turrets and guns, etc. are built to meet specific requirements for length, height, width, and rail construction. Features are: all-steel welded tubing, expanded-metal treads and platform, and ample space for both tools and workers. —*Ballymore Company, Wayne, Pa.*



Oil and Coolant Dispensing Unit Has Four-Way Pumping Valve

Model 110-R-4 is an oil and coolant dispensing unit equipped with an electrically driven pump and four-way valve to allow for pumping in or out. Discharge hose is fitted with a trigger nozzle for easy control by the operator.

Standard unit has a capacity of 75 gal. with a 4-in. hinge fill opening and a 4-in. plug clean-out door. New model is furnished mounted on 12-in. semi-pneumatic rubber-tired wheels as shown, or is available with 30-in. steel wheels.

W. R. Carnes Co., Verona, Wis.

Get the most out of your

LELAND-GIFFORD

DRILLING MACHINES

use *AIR* with care

Careless use of compressed air in cleaning the machine or clearing the work can result in blowing chips, dirt or grit onto the quill, rack, crosshead or other precision fitted surfaces. Use air with care and your Leland-Gifford Drilling Machines will continue to deliver the faultless precision performance for which they were designed and built.

A small point? Yes . . . but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them . . . with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

***SAVE TIME*— CONTACT THE OFFICE NEAREST YOU**

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U. S. A.

Yale High-Lift Platform Truck

This 4000-lb Worksaver model has a lowered platform height of 6½ in., and will lift loads up to as high as 126⅛ in. For stability and traction, the unit has an articulated frame that permits continuous floor contact of load and drive wheels, despite ramps and floor variations.

The hoist pushbutton is located on the operator's control handle. A hand- or foot-operated lowering control on the front of the battery compartment permits adjustable-speed lowering. Twin hydraulic pumps and motors are used for fast lifting. The hydraulic system includes a relief valve to protect the equipment from overloads.

For safety the unit's brakes are applied and power is off when the control handle is either in the full-up or full-down position.

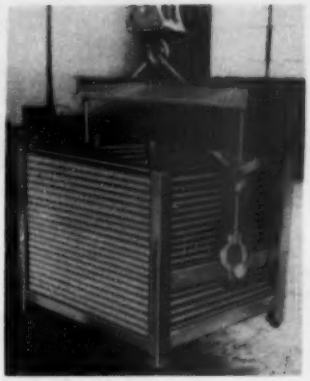
The Yale & Towne Mfg Co, Philadelphia Div, Philadelphia 15, Pa.

A homogenized grease lubricant, called Lead-Lube, has a high metallic-lead content in the form of pulverized dust, kept in permanent suspension. It forms self-lubricating surfaces over all wearing parts of gears and bearings to protect surfaces from wear. In the case of older equipment the metallic lead resurfaces pits and scores, and is said to restore a degree of efficiency comparable to pre-wear standards.

Knapp Mills, Inc., L. I. City, N. Y.

Portable fog-spray nozzle with a carefully controlled spray pattern and volume can be used for a variety of industrial uses — cleaning, washing, applying chemicals, and for certain kinds of fire protection. The atomizing elements are a series of interchangeable fan spray disks machined from solid stainless. Disks are available for fan angles from 10° to 90° with a 1/10- to 8-gpm flow. The nozzle operates at ordinary 30- to 100-psi pressure.

Bete Fog Nozzle Inc., Greenfield, Mass.



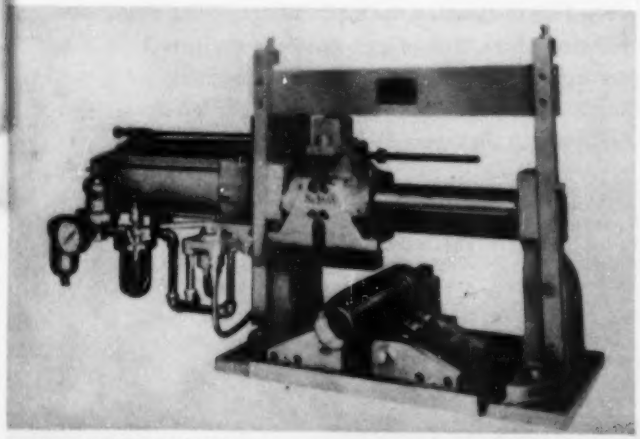
Portable Scrap Box

Scrap box is made of corrugated steel and has a yoke for handling by crane or hoist. The yoke is lowered over the box and lifting eyes slip over pivot blocks on the sides of the box. Trip fingers on the yoke drop over a bar-end welded on to prevent the box from tipping.

When the load has been lifted and transported overhead to the dumping point, the lanyard is pulled, lifting the fingers off the locking bar. Because of the low center of gravity the box automatically turns over.

Standard size is 36x42x30 in. deep with a capacity of 32 cu ft. Other sizes available on order.

Equipment Mfg. Inc, 21550 Hoover Rd, Detroit 5, Mich.



SHELL-MARKING MACHINE has been improved so that 50% more markings may be made on each shell. An overhead, horizontal bar has been added to the work-head against which a precision ball bearing rolls to relieve the pressure on the slide marking head. The marking-head holder has been enlarged and provided with set-screw adjustment. Adjustable cradle rolls have been so constructed that double ball bearings directly carry the rotating load of the shell, projectile, or other product to be marked. An adjustable stop is provided for positioning the mark. —*The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J.*

Smooth-Surface Porous Sheets In Stainless Steel and Alloys

High-tensile, smooth-surface, porous stainless-steel sheets are available with shear strengths in the range of 60,000 psi; surface smoothness is comparable with commercial rolled stainless-steel-sheet finishes.

Applications include use on rotary vacuum filters cleaned by blowback, on vacuum plate filters, fluid catalyst filters where cake is such that it is not readily discharged by blowback, etc. High pressure filters, particularly those for aircraft service, can have less weight.

Flow capacities range downward from 200 cfm of air per sq ft of filter surface at 10-psi differential pressure, or from 20 gpm per sq ft of water at 10-psi differential. Pore dias from 0-20 microns.

Material is stocked in type-304 stainless steel; other alloys on special order. Filter assemblies in pipe sizes from ¼ to 10.

Micro Metallic Corp., 30 Sea Cliff Ave., Glen Cove, N. Y.

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

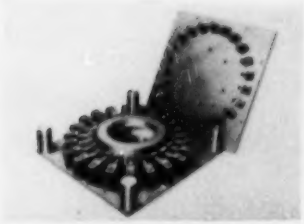
During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

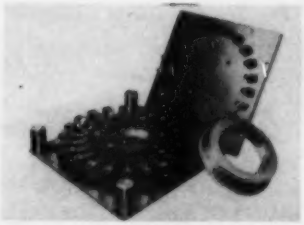
Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks





Holes Punched in Side of Work By Wales H-Units

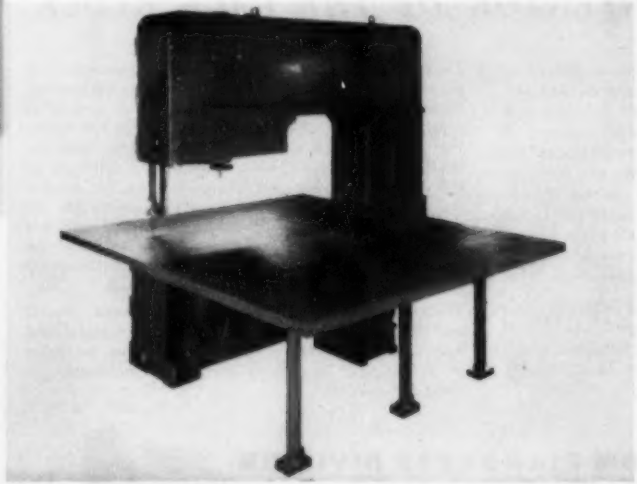
Wales Type-H hole-punching units are designed for punching holes in flanges, angles, container sides, and similar shaped and formed work. Punching holes in the side of the work instead of on top of the flat surface is possible because the punches move back and forth horizontally rather than up and down.

These units eliminate expensive, built-up, single purpose, cam-action dies. Each Type-H is independent and self-contained which permits the same group of units to be used many times on press-brake rails and on templets in stamping presses and press brakes. All parts—punch, die guide and stripping spring are held as a unit by the holder. In addition, the holder assures alignment of punch and die which eliminates the many hours customarily required to align conventional dies.

Press "downtime" between production runs is reduced by setting up the patterns outside the press. This is made possible because nothing is attached to press ram.

Punches and dies are removable from the unit for sharpening and replacing. In cases of replacements, the entire unit may be removed and replaced quickly in the setup without disturbing the other units or the other parts of the setup. With a few extra units, it is possible to interchange a unit rather than stop a production run to replace or sharpen a punch or a die. Dulled punches and dies may be sharpened later.

Wales-Strippit Corp, 335 Payne Ave, N Tonawanda, N Y



HUGE BANDSAW will be used in conjunction with a 50 000-ton press to trim the edges of complete airplane wing stampings. It is equipped with two regular 36-in. wheels above and below the sawing area and a third wheel of 30-in. dia in the column at the left of the table. It is powered by a 15-hp motor and multiple V-belt drive. —*Tonnewitz Works, Grand Rapids, Mich.*

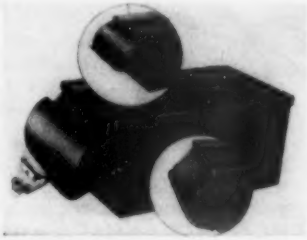
Spiral-Roll Fastening Pin Assumes Shape of Hole

Spiral pins are machine pins which have been formed by rolling strip steel spirally. The physical properties of the pin can be changed by varying the thickness of the strip, the tightness of the coils, and the number of coils in the spiral. The force required to insert the pin can be varied so that one pin will require heavy pounding while another can be inserted merely by pressure of the thumb. Thus there is a pin for every application whether the force required for inserting or removing the pin is a critical factor, or whether maximum shear shock and vibration absorption qualities are what are needed.

The resistance of the coil to displacement causes the pin to assume the shape of the hole throughout its length and securely locks the pin in position with a uniform distribution of stresses. They can be easily removed and reassembled because they expand to their normal size upon removal and do not damage the hole.

The pins are for use in holes drilled with standard drills and with no reaming. While standard models are made from strip steel and are heat-treated, they can be made from other materials such as stainless steel, brass, aluminum, etc.

C.E.M. Co, 24 School St, Danielson, Conn.



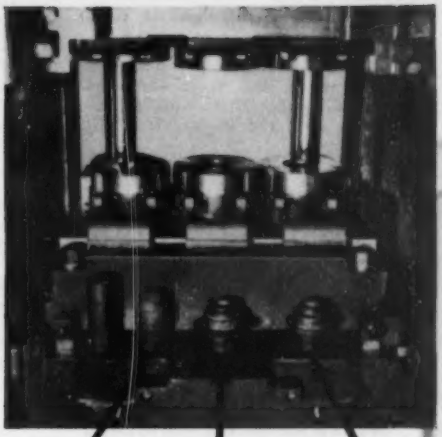
Hooded Stackbin to Protect Small Parts from Dust

This hooded bin is designed to protect small parts and materials from dust and to permit handling without spilling the contents. The hood is fastened in a closed position by a positive latch which can be easily released by a light finger pressure.

Known as the Stackbin they stack together quickly and positively in tiers for storage or assembly. Standard sizes range from 3½ x 6 x 3¼ to 15 x 24 x 11 in.

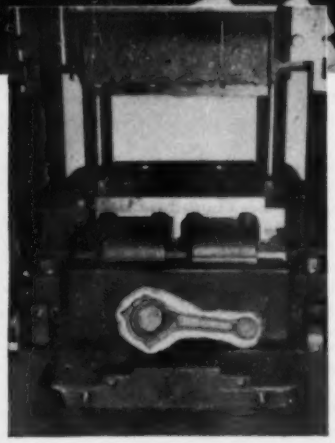
Stackbin Corp, 1139 Main St, Pawtucket, R. I.

FORGED IN AJAX PRESSES



BUSTER OPERATION | FINISHED FORGING | BLOCKER OPERATION

The progressive forging operations necessary for forming gear blanks for heavy trucks are shown in the foreground. Above, the dies mounted in a 1600 ton press, are in the following order: buster die on the left, blocker die on right and the finish forge die in the center. Each operation is shown in front of the die it is formed in.



Shown here are the dies and bolsters mounted in a 1600 ton press. The product, a heavy automotive connecting rod, is pictured in the foreground.

THE

Ajax

MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

510 DEARBORN ST. CHICAGO 7, ILLINOIS

DEWART BUILDING NEW LONDON CONN.

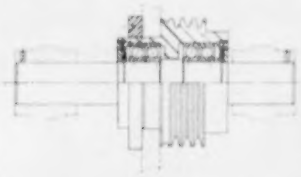
WRITE FOR BULLETIN 75 B

Threaded Steel Rod Saves Time on Maintenance Work

The Redi-Bolt comes in straight 36-in. lengths and in six dias—¼, 5/16, 3/18, ½, ⅝, and ¾ in.—threaded the full length. It is made of cold-drawn steel and is coated against rust.

Long straight bolts and adjusting rods can be made in a few seconds by hacksawing to size, and fitting with standard nuts. Or, after heating the rod with a blowtorch, it can be bent into U-bolts, L-bolts, eye-bolts, or any one of a dozen other shapes.

Redi-Bolt, P. O. Box 6102, Chicago, Ill.



Interchangeable Spindles for Brown & Sharpe Universal Grinders

These ball bearing spindles are easily installed by loosening the hand screws and removing the old bronze bearings and shaft assembly. The new spindle is then inserted locating the steel sleeves in the old bearing caps. The hand screws are then pulled down with no danger of overtightening.

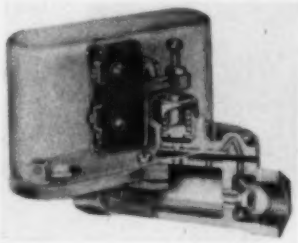
The preloaded bearings are extremely rigid both axially and radially. It is claimed that with this spindle very accurate plunge form grinding, square shoulders, and fine finishes can be produced. The bearings are permanently grease lubricated and sealed.

Whitnon Mfg Co, New Britain, Conn.

No bucking or special tools are required and the rivet can be driven without access to the rear side of the work. Prongs at the end of the rivet expand against the back sheet and form a permanent blind head that draws panels tightly together. With the pin driven flush, the outer head has a neat finished appearance—there are no stems to trim off or file.

The rivets are available in modified brazier or 100° countersunk-head styles, with grip lengths from 1/32 to 13/32 in.

Southco Div, South Chester Corp, 1518 South Penn Square, Philadelphia 2, Pa.



Hays Automatic Interlock Operates Switch or Alarm

The Shur-Flo automatic interlock operates an electrical control switch which renders equipment inoperative or operates an alarm when the flow of water, air, or light oil in the supply lines deviates from requirements. This action prevents the possibility of damage to the equipment. The unit is made in two models, one of which shuts off the operation when the fluid flow falls below the required predetermined minimum, and the other when the supply exceeds a given maximum rate of flow.

Known as the Shur-Flo, it operates on a pressure differential across a nozzle. An electrical switch makes or breaks contact in accordance with the movement of the lever arm and plunger that transmits the diaphragm action to the switch.

Hays Manufacturing Co., Erie, Pa.

Small-Size Drive Rivet

This ⅛-in. dia. hammer-driven blind rivet is installed merely by tapping on a pin with an ordinary hammer.

Speed-Reducing Pulley Increases Drillpress Capacity

The Pull-Gear speed reducer enables larger drills to be used on the drillpress without burning or stalling the motor. Unit is claimed to be able to mount directly on a drillpress motor in less than 5 min. It replaces the standard three-step pulley, making possible a gear reduction of 4½ to 1 on each of the pulley steps.

The operator then has three intermediate speeds at his disposal, plus the three original pulley speeds, allowing him more flexibility. The unit is totally enclosed and made of aluminum. It is available in shaft bore sizes of ½, ⅝, and ¾ in. A slow speed of 100 rpm is possible.

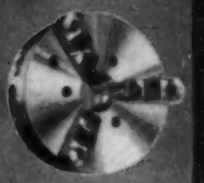
The lock or driving pin is engaged by adjusting a key on top of the unit which throws into place an inner gearing ratio giving the consequent speed reduction. Price, fob point of shipment, is $55.

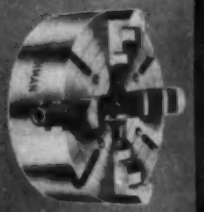
The Pull-Gear Company, 11125 Dequindre, Hazel Park, Mich.

A barrel burnishing emulsion, called Blue Magic No. 0-221, is said to produce a hand-buffed appearance in metal with any tumbling medium in standard barrel finishing equipment suitable for wet tumbling. The product will coat a cutting medium and make it a burnishing medium. It mixes readily with water and can be removed from cutting or other work by a water rinse.

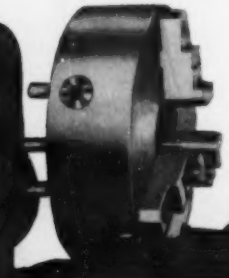
Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24, Pa.

CONSERVE YOUR MAN-POWER

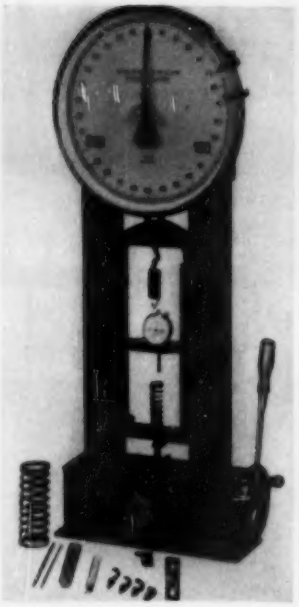




. . . at the machine!



CUSHMAN



Spring Tester for High-Quality Production Testing

This tester for checking loads and deflections of compression and extension springs is said to be useful for both general-purpose and high-quantity production testing; speed varies from 300 to 600 tests per hr.

Production stops and tolerance markers are easily adjustable, and accuracy is guaranteed within ¼ of 1%. Steel rules 12 in. long measure lengths in 32nds and 64ths on one side and in decimals in 10ths and 100ths on the reverse.

The instrument loads up to 300 lb, spring dias up to 4 in., lengths up to 12 in. for compression and 10 in. for extension. Width of base 14½ in., depth 5 in., height 38 in., dial 15 in. OD, and net weight 70 lb.

Carlson Co., 277 Broadway, New York 7, N. Y.

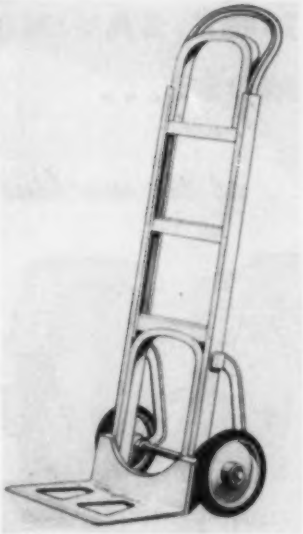
Direct-Action Magnetic Brake Eliminates Levers and Linkage

This magnetic brake contains only six major operating parts; direct, automatic set and release action between the solenoid and armature eliminates all levers and linkage. The unit is of a one-piece doughnut design that permits the motor's output shaft to extend completely through the brake so that both ends of the motor shaft may be utilized for powering two pieces of equipment when desired.

Weight and over-all length of the brake are said to be approximately one-half that of other makes. Lining wear is automatically compensated for by spring tension. Brake torque remains the same, eliminating inspection and hand adjustment procedure. Other features include automatic operation, manual release and automatic re-set, and simple disassembly.

Brakes are available in 3, 10, and 25-ft-lb continuous duty ratings, and 15- and 35-ft-lb intermittent duty; they can be mounted by standard methods, or to NEMA C-face endbells.

Reuland Electric Co., Alhambra, Calif.

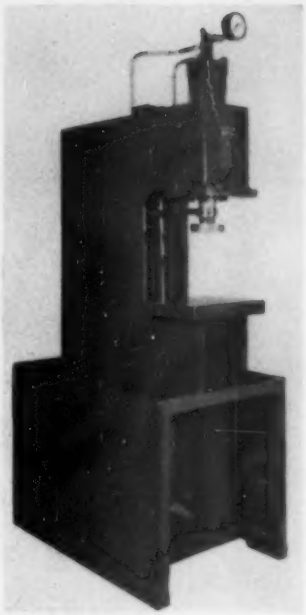


Removable Stair Climber On Magnesium Hand Truck

Hand truck made of magnesium weighs only 16 lb and has a load capacity of 450 lb.

The use of mechanically joined, standard parts and assemblies provides for inexpensive parts replacement and truck repairs. The stair climbers have also been designed as standard, interchangeable units.

Magline, Inc., Pinconning, Mich.



Hydraulic Gap Press

Munton Super Model hydraulic gap press is a belt-drive unit with a six-cylinder wobble-plate hydraulic pump. Features include an external drain on piston rod and on both ends of the 4-way valve to eliminate seepage; felt wiper on piston rod and both ends to wipe walls of the cylinder as it moves up and down; packing on rod is a combination leather and Sirvene.

Ram is guided by an arm which travels between two bars of steel for full length of stroke independent of the stroke control rod. Press is of all-steel welded construction equipped with Parker triple-lock flared fittings on high-pressure lines, and 5-hp, 220-440 v, 3-phase, 60-cycle motor and starter.

Munton Mfg. Co., 9400 Belmont Ave., Franklin Park, Ill.

Electric-weld mills for producing non-ferrous tubing come in three sizes with a total capacity range of ¾ to 8 in. dia, on metal thicknesses ranging from 0.025 up to 0.140 in. Practically all aluminum alloys available in coiled-sheet form, copper alloys, various brasses, nickel, monel, inconel, and stainless steels are being welded at speeds ranging from 50 to 90 fpm.

The Yoder Co., Cleveland 2, Ohio

Here's Proof

That It Pays to Use SUNNEN HONING on Jobs Like This

SUNNEN® HONING MACHINES
"Accuracy at Low Cost"

Clutch Roller Housing

Problem:

To hold tolerance of +.00025", −.00000" on a production job.
MATERIAL: 1020 steel — HARDNESS: Rockwell 60 "C"
HOLE DIAMETER: 1.248" — LENGTH: 1.250"
STOCK REMOVAL: .002"

Solution:

Sunnen Model MBB-1290 Honing Machine, with Sunnen Simplex Honing Tool. Honing machine was delivered and production was under way in less than 6 weeks after original inquiry.

Results:

Smooth, accurate holes well within specifications, at production rate of 50 per hour. Mating parts fit perfectly, *with no selective fitting.* Honed parts improve equipment performance, extend machine life.

Sunnen Honing is showing similar results on hundreds of different parts in leading plants across the country. It's accurate, easy to use, fast—often does the job when nothing else will. On short runs you can often complete the job in less time than it would take to set up for other methods. Average installation costs less than $1,000.00.

HERE'S WHAT THESE VERSATILE MACHINES CAN DO FOR YOU

- Generate geometrically round and straight holes.
- Eliminate grinding in many cases — remove up to .006" and more from hardened steel.
- Produce bearing finishes to 2 RMS in hardened steel.
- Correct out-of-roundness and warpage.
- Eliminate bellmouth and taper in holes.
- Remove burrs and flash from holes.
- Correct heat treat and assembly distortion.
- Hold accuracy to .0001" and better.
- Salvage expensive rejects from other operations.
- Eliminate jigs and fixtures — most jobs can be set up in less than a minute.
- Produce accurate blind holes.
- Size and finish holes with ports, lands, keyways.
- Hone metals, glass, plastics, ceramics.
- Hone diameters from ⅛" to 2⅜".

Send for NEW FREE BOOKLET

Shows you many different ways Sunnen Honing is helping others—suggests ways it might be helpful in *your* plant.

SUNNEN PRODUCTS COMPANY
7925 Manchester Ave., St. Louis 17, Mo.

☐ Send me FREE Case History Booklet on Sunnen Honing.

☐ Have a Sunnen Honing Engineer call.

Name .....

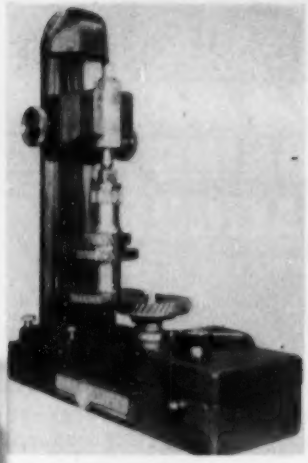
Company .....

Address .....

City ..... Zone. State .....

Let SUNNEN HONING Solve Your Hole Problems

SUNNEN PRODUCTS CO. 7925 Manchester Ave., St. Louis 17, Mo.
Canadian Plant: Chatham, Ontario



Red Ring Gear-Rolling Fixture Indicates Size Errors, Roughness

The adjustable workhead is set at precise center distance from the master-gear spindle, which is carried on a floating spring-loaded slide. This is usually done with precision gage disks.

When the work gear is rolled in mesh with the master gear, the errors indicated above are read directly on a dial indicator actuated by any movement of the master gear slide.

The upper center of the column workhead is counterbalanced for quick setup, and spring-loaded for easy loading and unloading. The knob on the right of the column is used to raise or lower the center slide; that on the left is used to lock it in place.

National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

Vane-Type Oil Hydraulic Pump Can Be Used As Fluid Motor

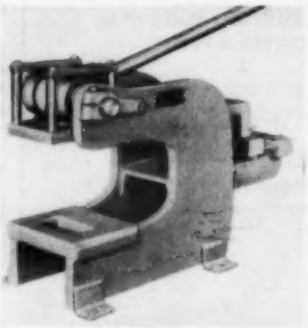
Dual-purpose 2000-psi vaned oil-hydraulic pump can also be used as a fluid motor.

Unit permits either clockwise or counter-clockwise rotation for both pump and motor operation; direction of rotation in any type of application can be reversed by changing position of the pumping cartridge.

Each of the four available sizes is offered with a choice of cam rings to widen range of oil delivery or torque ratings. In pump applications capacity levels range from 2½ to 60 gmp maximums; in fluid-motor use, range is from 12 to 257 in.-lb. of torque per 100 psi.

Vanes in the unit feature dual sealing edges to assure better valving action at point of exhaust. The porting blocks can be used interchangeably as either suction or pressure ports for pump needs, or as inlet and outlet ports in motor applications.

Denison Engineering Co., Columbus, Ohio.

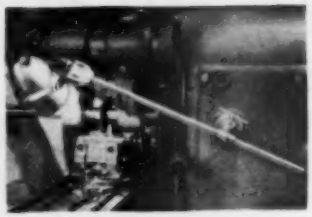


Aligning Leaf Assembly On Leslie Horning Press

Positive alignment with 5¼-in. die space, 12-ton capacity and narrow bed to permit horning or flange-notching operations feature this press.

It is claimed that punch and die alignment is accurate to 0.0001 in. This accuracy is maintained by the aligning leaf assembly, to one end of which the punch is fastened. The other end is attached to the press frame by means of a flat spring serving as a pivot when the punch is raised and lowered. Because of the rigidity of the leaf assembly, except at its flexing point, and a crankshaft that applies pressure to the leaf at two widely separated points, it is unnecessary to center the load on the punch plate. Notching is permissible in any direction without punch heels.

Leslie Welding Co., 2945 W. Carroll Ave., Chicago, Ill.



Oil Damage Prevented on Adjustable Machine Lamp

Textolite bearings and an oil-resistant cord with added Vinylite insulation is used on this machine lamp to prevent oil damage. Protection against electrical failure is provided by not running the cord through swivels or bearings.

A porcelain socket and special heat-resistant cord insulation within the reflector conform to Underwriters specifications.

The operator can make friction adjustments to lock the lamp in position or to permit repeated movement. The on-off switch is mounted on the reflector next to the adjustment knob.

Standard 40- and 60-watt bulbs or 75-watt reflector bulbs may be used. A grounded, 3-conductor cord, which prevents any voltage difference from appearing between the machine and the lamp, is provided at slight increase in cost.

Bretford Manufacturing Inc., Franklin Park, Ill.

Pulley lagging compound uses, as one of its main constituents, Neoprene—the chemical rubber. The pulley surface can be quickly lagged in place by either brush or spray. It isn't even necessary to remove the pulley from its shaft unless sandblasting or vapor degreasing is required. Since the compound gains strength over a period of time—reaching its maximum in eight days, the pulley should be allowed to cure as long as possible.

Main Products Corp., 1241 Carpenter St., Philadelphia 47, Pa.

Grease filter is specifically designed to remove entrained oil from entering exhaust ducts. This prevents fire hazards and prolongs the life of fan motors and other mechanical equipment. The woven wire-cloth filter element provides a large grease-holding capacity and low air resistance. Assemblies include holding frames, supporting angles, end seals, spring clips, and fireproof felt seals.

Air Filter Corp., Milwaukee, Wis.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Our Brake Die Steel Solves Wear and Warp Problems

We've never introduced a more popular specialty steel. And there are good reasons why more and more shops are becoming regular customers for our Brake Die Steel. One distributor writes: "Your Brake Die Steel is going over big out here. Not only does it machine easily, but it holds its size and shape beautifully." Another says: "My customers are highly pleased because it wears and wears . . . die costs have been cut in half."

Many shops are accustomed to using just any kind of steel. Now they're finding it's a whale of a saving to use a steel that's specially intended for dies used in sheet-metal brakes.

Our Brake Die Steel saves time and money right at the start because we ship it in the heat-treated condition — it's ready to machine, needs no further hardening. Every bar is carefully heat-treated by oil-quenching and tempering. Then it is straightened, stress-relief-annealed and straightened again so that it won't warp when machined to contour by the die-maker.

Here's a steel you can count on to *stay* straight. Best of all, it far outwears ordinary steels.

We stock Bethlehem Brake Die Steel in standard sizes in our Mill Depot; it's also stocked by many distributors of Bethlehem tool steels. Folder 560 gives full details.

This four-way die is typical of the uses of our Brake Die Steel.

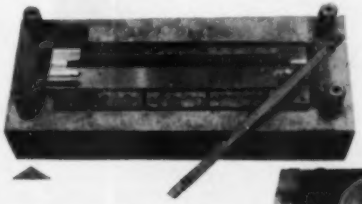
Lehigh H Tool Steel Helps Build Big Grain Combines

It's easy to see why the modern self-propelled combine makes old-timers blink in admiration and wonder. One such machine made by Gleaner Harvester Corp., Independence, Mo., requires but one man at the controls. It performs a continuous harvesting operation as it cuts a 14-ft swath through vast fields. Cleaned grain pours into a 50-bushel bin in a steady stream. In just 90 seconds the bin can be unloaded while the machine continues on the go.

It takes precision manufacturing to make these mechanical marvels run smoothly and dependably. And that's where Bethlehem tool steel comes in.

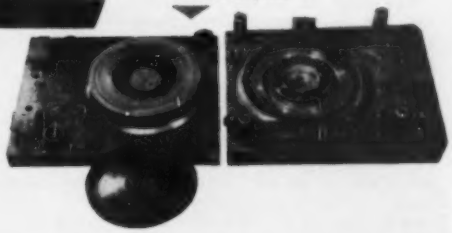
Our Lehigh H tool steel, for example, is used for a variety of tools and dies that turn out many vital combine parts from sheet steel. Gleaner's well-equipped toolmaking division reports complete satisfaction with this fine grade of air-hardening tool steel. Its high-carbon, high-chromium content makes it first choice for high production because of its long-wearing properties. And it has minimum distortion during heat-treatment.

This Gleaner-Baldwin self-propelled combine does everything but bake the bread as it cuts a 14-ft swath in a wheat field. It's a one-man operation.



Raddle slats, which convey the crop to the combine separator, are produced from 12-gage sheet steel by this die of Lehigh H tool steel which forms, pierces, and cuts off. Die shown has already produced about 100,000 pieces.

Lehigh H is also used in this blanking, flanging, and dishing die which produces a 17-in.-diameter cylinder head for the threshing mechanism. This die operates in a 400-ton press.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Use Shock Steels for Shock Tools

When using standard manganese oil-hardening tool steels (such as our BTR grade) for jobs requiring more than average shock-resistance, the usual practice is to temper the tool or die so that the hardness is reduced to about 50 Rockwell C. This is not recommended, because at a given hardness a steel of this type, having a relatively high carbon content, can't match the shock properties of a lower-carbon, shock-resisting steel.

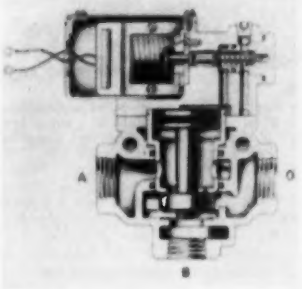
If a tool has to be tempered that far to get the necessary toughness, then probably a shock-resisting steel should be used rather than a general-purpose steel. Omega, our silico-manganese steel, is ideal for all types of cold-battering tools . . . and 67 Chisel, our chrome-tungsten grade, is the steel to use for a wide variety of shock tools and master hobs.

Lightweight Die Grinder

This 1¾-lb pneumatic die grinder is designed for extreme accuracy on large, tough grinding jobs. It is said to be particularly effective for rotary filing on aluminum and magnesium castings.

PGK2122L has a 4-vane rotary motor, adjustable to various speeds, a speed regulator, and quick-action lever throttle. Tool is equipped with a noise silencer; eight sizes of Erickson collets are available.

Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill.



Reduced Maintenance on Hannifin Air Control Valve

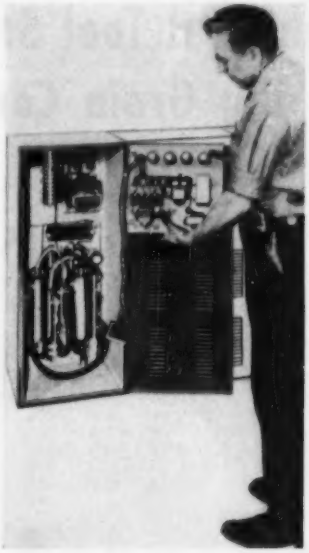
Pilot-Master valve for the directional control of air pressure features both versatility and simplicity for decreased maintenance.

The main or master valve portion can be operated either 2-way or 3-way; normally open or normally closed to pressure, without any internal change whatever. This is because the inlet and exhaust ports are interchangeable. Port A is the inlet for normally closed operation, the exhaust port for normally open use; Port B is the inlet for normally open use, the exhaust for normally closed. The simple insertion of a pipe plug in the exhaust port converts the valve for 2-way use. Port O is the outlet in any case, normally to an air cylinder.

The main valve is pressure operated, through a piston poppet. Since pressure acts both to actuate the poppet and return it to its normal open position, the main valve is completely springless, which eliminates a common source of valve failure.

Maintenance is further simplified because the piston-poppet assembly, only moving part of the main valve, fits in a removable cartridge which acts both as the cylinder for the piston and as the upper seat for the poppet. This cartridge can be removed or replaced simply by removing the cover, without disturbing any of the many various pipe connections.

Hannifin Corp., 1118 S. Kilbourn Ave., Chicago 24, Ill.



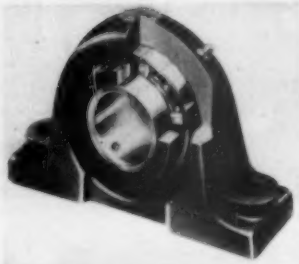
Simplified Electronic Welder Control

Design of this electronic, non-synchronous resistance welder control has been simplified for easier installation, less maintenance, smaller size, and greater mounting versatility.

NEMA-3B weld and sequence timing circuit requires only four tubes plus valve and firing relay. Firing of power tubes is synchronized to minimize transients and ease stress on the welding transformer. Interchangeable 3B and 5B timer panels are quickly detached from the door. Plug connectors to the power pack in the cabinet permit easy replacement. The 15x15x37-in. unit requires little more space than formerly needed for the ignitron contactor alone.

Enclosure design permits wall or side-of-machine mounting with the same controller, without additional trouble of relocating the adjuster dial assembly.

Square D Co., 4041 N. Richards St., Milwaukee 12, Wis.



Unit Pillow Block With Lubricant-Retaining Seal

A unit pillow block with a lubricant-retaining seal, said to achieve frictionless wiping action against the inner bearing ring, has been designed for general machinery use.

Features of the Hess-Bright SY unit are rotating flingers for dirt exclusion, a collar with set screws for easy installation, spherical outer ring compensation for initial misalignment, re-lubrication through Alemite fitting, and interchangeability with existing installations. Shaft dias range from 1-3/16 to 2-15/16 in.

SKF Industries, Inc., Philadelphia 32, Pa.

Floating Anchor Nut Weighs Less Than Corresponding Fixed Unit

This lightweight, self-locking floating anchor nut consists of a threaded nut portion and a retaining shell providing a 1/16-in. radial movement between nut and anchoring portion. Lateral float movement between nut and shell facilitates alignment of nut and bolt in subsequent assembly.

It is identical in outline and size to standard fixed anchor nuts of comparable thread dimensions, permitting complete interchangeability, and it is lighter in weight than its corresponding fixed anchor nut. Upper threads are elliptical and highly resilient, allowing all threads to carry the actual load, and eliminating the necessity of an auxiliary locking device. All spring-steel construction permits use to 550°. Nut bears directly against its mounting surface, provides good bearing qualities, and push-out characteristics.

Kaynar Mfg. Co., Kaylock Div., 820 E. 16th St., Los Angeles, Calif.

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ARE JUST RIGHT FOR YOUR

LARGER TRACER

JOBS, TOO

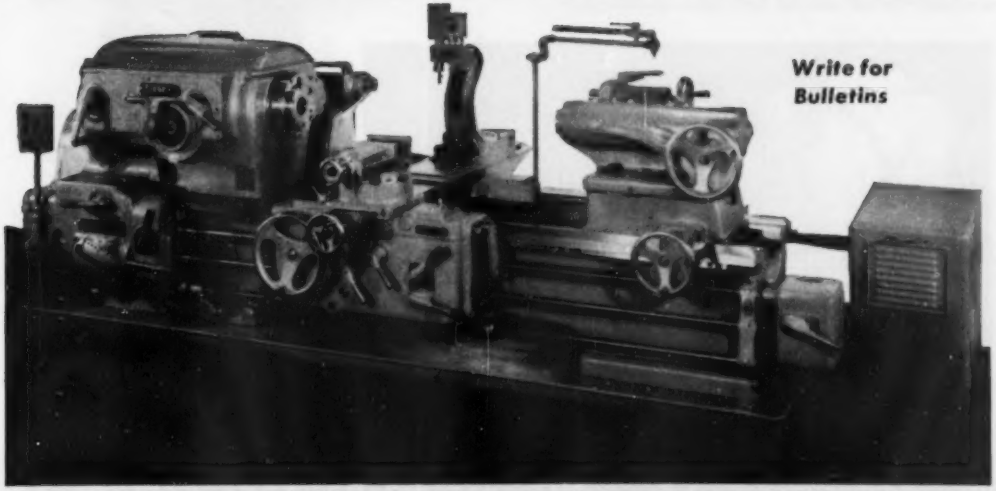
25" TRACER LATHE RAISED TO SWING 33½"

SIDNEY LATHES OFFER THE PERFECT COMBINATION OF RUGGEDNESS & SENSITIVITY

RUGGEDNESS AND BRUTE STRENGTH . . . for heaviest cuts and to withstand the most severe strains, power transmitting elements are made of unusually large proportions of finest, heat treated and hardened materials.

DELICATE SENSITIVITY . . . the Sidney FLUID TRACER permits unlimited reproduction, true to form in every detail.

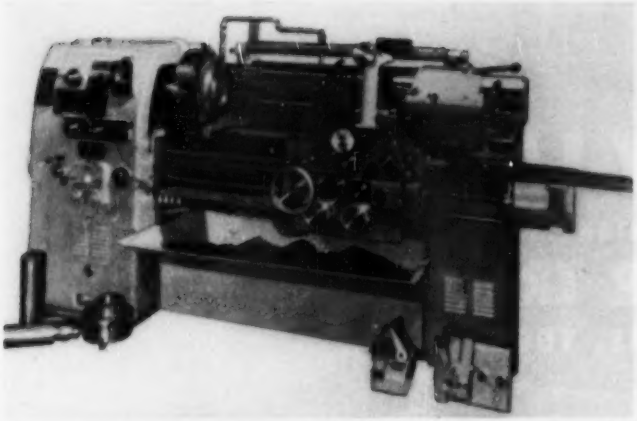
SIDNEY LATHES ASSURE FAST, ECONOMICAL PRODUCTION EVEN ON TOUGHEST TYPES OF WORK



Write for Bulletins

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904



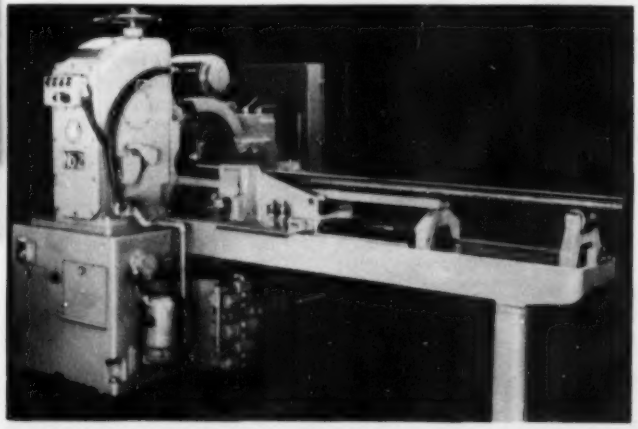
Austrian Copying Lathe is Controlled by Electromagnetic Clutches

The Sensitast copying lathe will make 90° cuts on the left or right side of the work. It can copy practically any outside or inside form. The traverse and longitudinal feeds operate at the same rate to produce a smooth finish; for a higher degree of finish, a feed reducer with magnetic clutch control is employed.

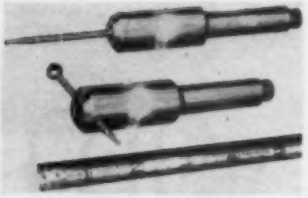
The V-ways are filled with oil at all times and leadscrew and rack are inside the bed, covered with telescopic chip guards. The tailstock, steadyrest, and templet are supported on vertical ways at the rear of the machine. This permits the tailstock to pass over the saddle without interference.

Swing is 17 in. over cross slide, 28 in. over saddle, and 37 in. over bed cover. Distance between center is 39 in. Imported by:

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.



CIRCULAR SAWING MACHINE can be equipped to automatically feed bar stock for shell forgings. The automatic feed consists of two heavy-duty, hardened, serrated feeder grippers mounted on a slide. The bar stock is positioned on the supporting V-channel under the hydraulically-actuated vertical vise for the initial cropping, squaring cut. Thereafter the feed is automatic. The grippers clamp the stock, and the entire slide, operating between positive stops, moves the stock foward the required length. As soon as the stock is clamped in the vise, the grippers release, the slide moves to the rear stop, and the grippers reclamp. Slide movement and clamping are by hydraulic cylinders. — *The Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13.*



Battery-Operated Center Finder

The Art-Mil Center Finder is a single-cell battery-operated device that lights up when the point desired is located. Designed for use with milling machines, lathes, jig borers and drillpresses where precision work is essential, the center finder provides accuracy to within 0.0001 in. when used to locate working points, or in slot and hole centering.

It is also useful as a comparator on a surface gage when equipped with a special holder. It can pick up dimensions by contact with height gage without use of feelers, and can be used as a warning stop where close tolerance is necessary.

Art-Mil Machine & Mfg., Inc., 170 Hosack St., Columbus 7, Ohio

Shaft-Mounted Speed Reducer Anchored with Torque Arm

Double-reduction shaft-mounted speed reducer has a capacity to 42 hp, and output speeds from 12 to 110 rpm.

Made by Dodge, and known as the No. 7, it has 59% greater hp capacity than the No. 9. It is anchored with a torque arm which fastens to any fixed object. A turnbuckle is used in adjusting belt tension.

Dodge Mfg. Corp., Mishawaka, Ind.

Broaching

have you heard this **TURBINE WHEEL STORY?**

It's a matter of design and engineering
...and it's all in the interchangeable fixture!

TWO TURBINE WHEELS
- ✓ with different diameters
- ✓ with 8-branch and 4-branch "pine tree" slots

BROACHED WITH THE SAME BROACH!

Here's an instance where **LAPOINTE** engineering resulted in the saving of time and money, tools and machines.

Because this jet engine manufacturer required *two sizes* of turbine supercharger shaft assemblies, we designed the slot so the *same broach* could serve for both diameter wheels. For the larger wheel, all four "pine tree" branches are used; for the smaller wheel only three are used.

The interchangeable fixture makes it possible to broach both wheels on the same machine, with the same broach!

50 YEARS IN BROACHING! We're the oldest in the world!
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Single Ram Vertical
BROACHING MACHINE

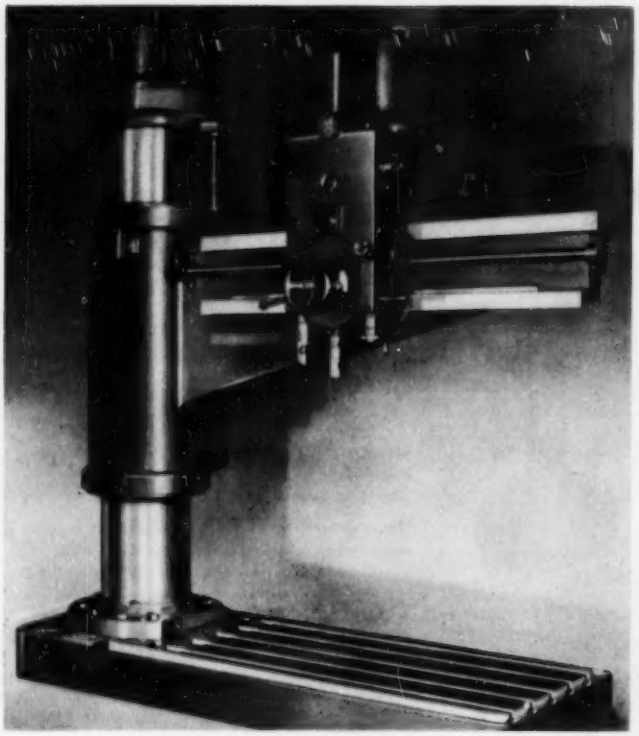
Available in several sizes and capacities.

Fully described in our Bulletin SRV-2. Write for it.

LAPOINTE ENGINEERING *can help you in all your broaching problems. Fifty years of experience in building broaching machines, broaching tools, and fixtures can be placed at your disposal promptly ... on request.*

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

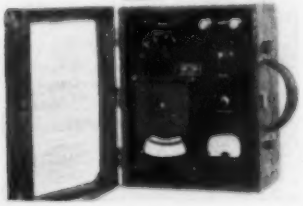


French-Built Radial Drills

Maxim heavy-duty radials come in two models with different size columns—15 ¾- and 17 ½-in.-dia. Drilling capacity in mild steel is 2 and 2½ in., respectively, with 20 spindle speeds of 32-2500 and 25-2000 rpm range, respectively. Arms for each model come in three sizes—4 ft 3 in., 5 ft 10 in., and 9 ft 1 in.

Spindle reverse for tapping is obtained through friction clutches. Imported by:

Parker Machine Co., Inc., 158 Pioneer St., Brooklyn 31, N. Y.



Tester Checks Aluminum Cleanliness Prior to Welding

A troublesome factor in the welding of aluminum sheets is their so-called cleanliness when presented to the welding head. The surface electrical resistance, in microhms, is a measure of the effectiveness of the oxide removal or cleaning process employed.

The Model 151-S Microhm Meter measures the total surface resistance of two sheets or coupons, when placed between two dummy electrodes. It can accurately measure a resistance as low as one millionth (0.000001) of an ohm and the readings are almost instantaneous.

The instrument scale is 0-75 microhms and is linear. If it is necessary to read higher resistance values than 75, a selector switch cuts in various multipliers which permit taking measurements up to 750,000 microhms.

The instrument is contained in a heavy oak case with waterproof finish. Total weight, including internal battery power supply, is 22 lb.

J. W. Dice Co., Englewood, N. J.

Drillpress Has Adjustable Table and Headstock

Model BK-25 is a new drillpress made by the Alfing Works, West Germany. Table and headstock are both adjustable; table is raised and lowered by a crank and supporting screw, and locked in place by a lever. Totally enclosed headstock is moved by hand over a distance of 6 in. and locked in position by hand lever.

Drilling capacity is 1 in. in steel and 1¼ in. in cast iron. Machine is adaptable to boring, countersinking, milling, and reaming. Worktable measures 26x28 in.

9-in. spindle stroke is driven by either flange-mounted or V-belt-drive 3-hp ac motor. Eight spindle speeds are available, ranging from 150 to 1640 rpm in geometrical progression. Drilling feed may be either manual or power; with power, feeds of 0.003 in., 0.006 in. or 0.009 in. per spindle rev are available. Drilling depth is set by a quick indexing stop. Machine can be used in a semi-automatic operation, in which the drilling spindle is brought into contact with the work by hand, and the feed engaged by pushing the hand lever sideways. An adjustable stop is used to disengage feed.

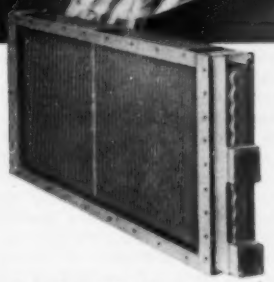
Imported by:

Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.

Revere-Trained Copper

HELPS TRANE CONTROL HEAT!

Trane Kinetic Orifice Tube. Orifices eject steam in direction of condensate flow, materially increasing efficiency, getting more heat out of the steam. Specifications for this copper tube were developed mutually by Trane and Revere.



Trane Type SDS Coil containing Kinetic Orifice Tubes, for heating use.

One of Revere's customers is the famous Trane Company, which makes heating, cooling and air-conditioning equipment for home, industrial, marine and similar applications. Trane relies on copper for tubes, because of high heat conductivity, resistance to corrosion and easy workability.

Like so many other Revere friends, Trane maintains close relations with the Technical Advisory Service, collaborating with it in developing specifications, studying specific corrosive conditions, and other matters of mutual interest.

For example, take the Kinetic Orifice Tube, a Trane design to overcome certain old handicaps found in the tube-within-a-tube steam distributing system. The Kinetic Orifice utilizes a jet action to accelerate the flow of condensate by discharging the steam in the direction of condensate flow. To produce such orifices in a copper tube requires a combination of shearing and flaring, and at first it was thought that the temper required for these operations would be so soft as to make it difficult to maintain the required straightness. However, study by both organizations finally developed a temper both workable and strong, now proved by several years of use.

If you are not now collaborating with the Revere Technical Advisory Service, perhaps it would be to your advantage to do so. Call Revere.

Trane projection-type Unit Heater employs copper tubes for both high pressure and low pressure work.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Coil for projection-type Unit Heater. The easy bendability of copper tube is a decided asset in forming the circular coils.

CUT OUR WAY

First in value—
First in sales

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Accept no substitutes! Pound for pound, dollar for dollar, SOL-SPEEDI-DRI gives you *more for your money*, all factors considered. That's why it's America's sales leader in the oil and grease absorbent field. Selected raw materials, careful processing, and laboratory controls keep quality always uniform. Send the coupon today for generous free sample and descriptive literature about how to "dry clean" your floors with SOL-SPEEDI-DRI.

SPEEDI-DRI CORP., 218 E. Washington Sq., Philadelphia 5, Pa.

Warehouse stocks maintained in principal cities of the United States and Canada.

* * *

Exporters in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1720 Chestnut St., Phila. 3, Pa.

FREE SAMPLE: Fill out the coupon and mail today for big, free sample and brochure.

Name_____

Address_____

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AM 7-7-52

ROUND TABLE Discussion

NEW EYES

Ed is trying the experiment of letting a worker do nothing for one day but look for improvements in the shop. Is this practical? Will the average worker waste the time or will he come up with some worthwhile ideas? Do you agree with . . .

MANAGEMENT has long realized that positive work improvement ideas are possible when an effort is made to enlist "new eyes" in the search for beneficial suggestions for improvement. Executives of companies in many major industries have submitted a suitcase full of statistics to show how great a portion of cost and labor-saving ideas come from the rank and file as well as top management. Analysis of suggestion systems and shop-improvement programs has revealed that it is not unusual for factory employees who can observe in a practical way to save their companies a considerable amount of money.

Delegating a different worker each week to do nothing for one day except look around the shop for improvements is a novel and profitable arrangement. In these days of increased production demands, the foreman may not be in a position to look for new ideas for improvement. Taking a worker off his regular job for a day and having him spend that day looking around the shop for improvements in work processes will give him a general picture of the functioning of the whole shop that will make him more valuable to the company by making him a better and more intelligent employee.

"New eyes" as a form of a beneficial suggestion system enlists the imaginations of men on the job who mesh gear with gear. It also questions the tradition of executives being their company's idea men first and foremost. Too often a top-level idea has everything but the homely virtue of being practical. Perhaps the executive's more important function should be the sifter, rather than sole originator, of grist for the mill.

Too often, a foreman may be so steeped in the traditional way of doing things that he doesn't know a real idea when he sees one. Too often, worker fails to put in the

effort necessary to execute an obvious improvement in his work. Through the "new eyes" observation system the delegated worker may be helped to overcome the inertia for making desired improvements, and the foreman may see the worth of an idea developed by the observer.

An efficient foreman, in delegating a member of his staff as his helper in bringing about shop improvements, can give the worker clues for suggestions needed. For example, he can stress the general possibilities for savings through using machines to the fullest extent. He can guide the worker to think about possibilities for improvements in material handling, methods, safeguarding equipment, improving methods of operation through work simplification.

The true purpose of observation is to teach the employee to think, to sell him the idea to be on the lookout for better methods of work, to encourage him to submit worthwhile suggestions. As a by-products, it will encourage the worker to look for improvements and put in the extra effort to execute a possible improvement in his own job.

The foreman can supplement his own planning for work improvement through an appointed shop observer whose personal investigations may bring some good ideas to light and whose fathering of these ideas will help to get them into practice. The worker and company will benefit from the plan becaue it offers the opportunity to exchange knowledge, stimulates new ideas and improvements on old ones.

Most foremen know that there is no better way to learn things than to get the other fellow's point of view. A local observer should have an interesting point of view toward local shop practices; a point of view that should prove of interest to a progressive foreman.

It has been proven that sometimes

"Wouldn't I have made a handsome doctor?"

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

"You can't see the trees because of the forest." A fresh viewpoint may focus desirable attention on some shop practice, procedure or machine operation, and lead to its ultimate betterment. Furthermore, the system of rotation of observers will stimulate an atmosphere conducive to greater idea productivity among the rest of the men.

Harry Kaufman
Philadelphia, Pa.

•

FOUR EYES

***WHOSE BUSINESS** is a shopman's need for glasses—or hearing aids? Is his pride more important than plant efficiency? Is it worth the money for the company to provide such services? Our readers' opinions—*

CERTAIN PHYSICAL defects are obviously a serious handicap to a worker's efficiency. Especially is this true if the defect happens to be a man's vision. Inasmuch as a pair of good eyes are essential to a man's ability to do a good job in the least possible time, there seems to be no doubt that he should be checked over and notified of any deficiency before being put on the payroll.

If he is down at the heels financially, give him to understand that it is expected that he will provide himself with the proper glasses within a reasonable length of time. This seems to be cold-blooded advice, but it is for the man's ultimate good.

When a man has been on the job for a number of years and his valuable peepers go back on him he should have them attended to so as not to aggravate the weakness. Whether the man should have to stand the expense of this correction is a matter dependent upon the viewpoint of the employer.

"Let's be more careful, Harris—that's a delicate machine!"

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fastest machining of all structural metals!

Magnesium parts can be machined at higher speeds and feeds than any other structural metal. This has proved an influencing factor in its use, even where weight saving is not of primary importance and the cost of the magnesium part is higher than the competitive material *before either is machined*. With power consumption as a basis of machinability comparison, magnesium requires only one-half to two-thirds the power required for brass or aluminum, one-third that for cast iron, and one-sixth that for steel. In one case a switch to magnesium from cast iron for pulleys resulted in a saving of 45 minutes per part. It has also been observed that cutting tools last from 3 to 10 times longer when machining magnesium than when machining aluminum under similar conditions. In addition, excellent surface finishes have been obtained because there is no metal drag or tear.

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GARRISON
GEAR CHUCKS
CUT SCRAP LOSS!

Here's WHY

Built-in accuracy and exclusive, patented fixed multiple location, "average-out" errors of cutting and heat treating.

EVERY GARRISON GEAR CHUCK ALSO FEATURES:

QUICK CHUCKING . . . Garrison gear chucks have increased production as much as 700%.

QUICK SET-UPS . . . Garrison gear chucks are ready for use as soon as they are mounted to a simple face plate or adapter.

SHORT OVERHANG . . . Assures closer limits and better finish.

VERSATILITY . . . Garrison gear chucks are used for any operation after the teeth are cut.

Garrison pitch line control gear chucks are "custom-built" for each gear by specialists who have manufactured gear chucks exclusively for over thirty years. This accumulated gear chuck knowledge pays off for you at final inspection.

To cut scrap loss, eliminate upset schedules and assure consistent, uniform high production day after day . . .

. . . SEND YOUR GEAR PRINTS FOR A QUOTATION!

Garrison
MACHINE WORKS, INC.
DAYTON 4, OHIO

hazard? It seems only fitting that he should receive some assistance in the way of compensation for a condition brought about by daily effort. If a man loses a finger, even through his own carelessness, compensation covers him, but, let him work himself bugeyed over some eyestraining job and what does he get? A pair of worn-out eyes.

It seems to be a small matter to be quibbling about but a man's eyes are something of indispensable value to him in carrying on his livelihood.

For one who is so fixed financially that it becomes a hardship for him to provide himself with proper glasses, I should think that some sort of a scheme could be cooked up whereby the employer could help him over the grade — either by providing him with glasses direct or else enabling him to put it on the cuff.

A worker who is to perform well has to have good vision. Whether this is brought about by the man's own efforts or by the assistance of the employer is something to be decided as the case is presented. I do think that the foreman has some say in the matter. I think it was a Chinaman who said: "A man is as young as he feels and he feels as young as he sees."

J Everett
San Francisco, Calif.

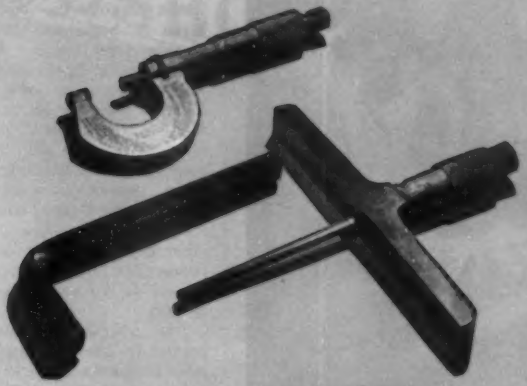
•

TO EACH HIS OWN

Is it practical to have apprentices do the roughing-out jobs and leave the finishing to top-pay men? Can you split jobs in this manner and not spoil both men? Is it fair to expect productive work from apprentices in particularly low-quality work? Pro or con, take your pick . . .

THE IDEA of splitting jobs by degree of skill is not a new one. It is tied up with job simplification and upgrading programs of modern industry. One of the most important developments in industrial relations has been making it possible for workers to advance themselves, both in skill and in earnings, by systematic promotions. This is known as upgrading, and is a product of the demand for increased production.

It had its beginning in the previous shortage of skilled craftsmen. To produce the needed volume of production, with only a small proportion of journeymen-mechanics available, management undertook a job simplification program where jobs ordinarily done by a skilled worker could be broken down into a num-



Standard symbols for **PRECISION**

A "mike" and an Allen Key keep steady company wherever precision measurements and precision adjustments go hand in hand . . . and where positive locking and vibration-free performance are important to maintaining precision.

Look for the First Name in precision screws at the Industrial Distributor who stands first in *his* field in your locality. He has the stock, the experience, and a wealth of specific information on applications for precision fastenings that you will find invaluable.

How We Take CHANCE OUT of Alloy Buying

Here's a spark tester checking bars of Ryerson alloy steel. By reading the spark pattern thrown off when each bar is touched with this whirling, abrasive wheel, the tester determines the steel's analysis. In this way he verifies quality—guards against mixed steels.

Spark testing is only one of many steps in the Ryerson Certified Steel plan for safer alloy buying—a plan especially important to you today, while restrictions are enforcing the use of leaner alloys with unfamiliar heat treatment response.

We also put every heat of Ryerson alloy steel through four separate hardenability tests, carefully recording the results on a Ryerson Alloy Certificate which goes with the steel. These tests enable you to buy Ryerson alloys on the basis of hardenability as well as analysis—the safest way to buy under today's changing conditions. And the recorded test results safely guide your heat treatment. So play safe. Order from Ryerson where you can specify hardenability and be doubly sure. Stocks are out of balance from a size standpoint, but in all probability we can take care of your requirements.

PRINCIPAL PRODUCTS

CARBON STEEL BARS —hot rolled and cold finished
STRUCTURALS — Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING — Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS — Allegheny bars, plates, sheets, tubes, etc.
REINFORCING — Bars and accessories, spirals, wire mesh
BABBITT — Five types, also Ryertex plastic bearings
MACHINERY & TOOLS —For metal fabrication

RYERSON STEEL

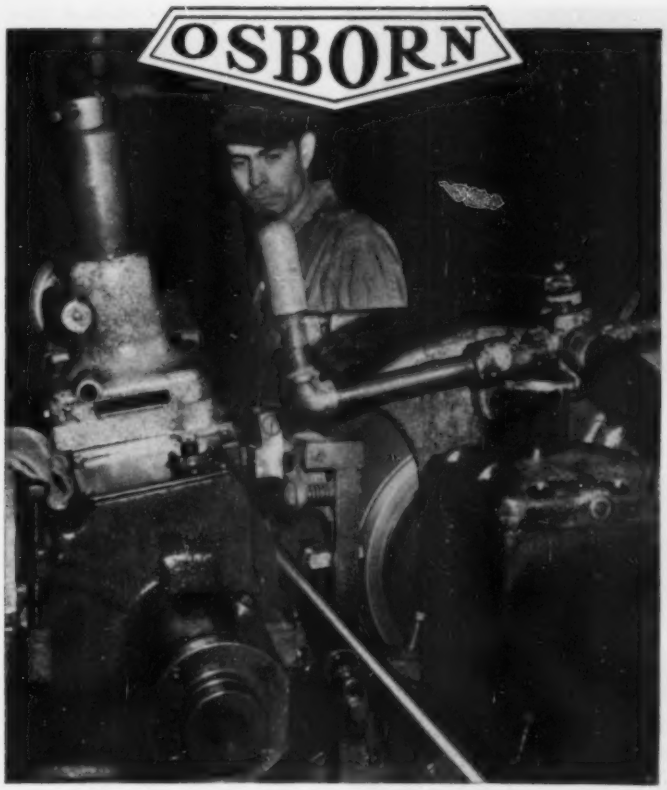
JOSEPH T. RYERSON & SON, INC.—PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA DETROIT • CINCINNATI • CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

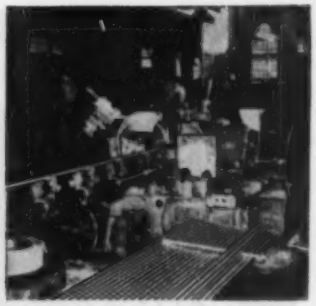
ber of operations. Those operations which required the least skill were given to beginners who had previously been trained to do that specific thing. Operations calling for low tolerances or great skill were given to journeymen. Thus journeymen, who formerly did all the operations in a job, did perhaps only one or two finishing operations; other operations were done by partly trained men who were advanced from one operation to the other as they proved skill and dependability. This procedure was known as job simplification or upgrading.

The upgrading technique has proven so successful, especially in mass production, that it has become a permanent part of our industrial system. Many workers look upon it with favor because it offers them an opportunity to get a better job at higher pay if they are willing to study and apply themselves. Management likes it because it permits better cost control, and enables employers to use less skilled workers for the simple jobs formerly done by journeymen, necessitating premium wages only to exceptionally skilled men who do the finishing work. Enlightened labor has come to see the advantages in upgrading, since it reduces production costs and thereby increases the employer's ability to pay higher wages.

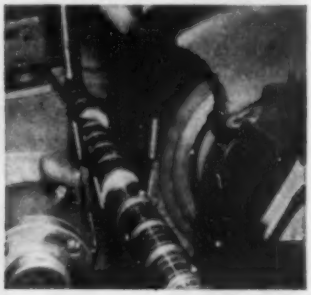
Experience has proven that job simplification or splitting jobs by degree of skill must be supported by a well-planned and administered employee training program to be successful. Skilled craftsmen have been found not inclined to teach apprentices or green men their skills, and the percentage of rejects

"I didn't see how we could lose, hiring someone with fifty years' experience!"





THE SET-UP. This shows the centerless grinding machine which also serves as a "centerless brusher". These pump rods vary from 1¼ in. to 1½ in. diameter . . . from 6 ft. to 36 ft. in length. Regulating wheel speed is 52 r.p.m.



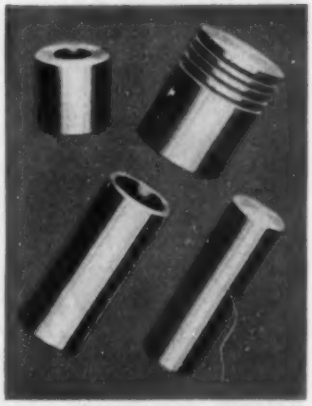
ANOTHER JOB. Here Centerless Brushing finishes cast iron pistons to micro-smoothness. Simplifies assembly operations and increases life of pistons and cylinders. Output of this machine is 10,000 pieces per 8 hours.

Finer finish . . . longer product life with Centerless Brushing

This machine does double duty. For removal of metal to close tolerance, it is a *centerless grinder.* Then, for finishing the surface to micro-smoothness it is a *centerless brusher.* Its conversion takes only a few minutes.

In the operation shown above, nickel-moly steel rods for pumps, are being finished by an Osborn Fascut Brush. Prior to brushing, the same machine with a grinding wheel in place of the brush made a rough grind, taking off .006 inch, and a finish grind, taking off .002 inch. Results of the Centerless Brushing: Produces a smoother finish. Reduces wear in pump packing. Reduces corrosive action on rods; makes them last longer.

An **O**sborn **B**rushing **A**nalyst helped develop this improvement. Ask your **OBA** to help *you* on all problems of cleaning and finishing! Call him today or write *The Osborn Manufacturing Company, Dept. 757, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



TYPICAL PARTS which are being improved by Centerless Brushing include pistons, piston pins, bushings, tubing . . . any cylindrical parts. It can be applied to many sizes of parts and types of material on a mass production basis.

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

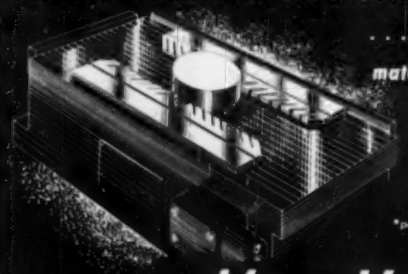
HOLDING POWER Plus!

Magna-Lock CHUCKS

Get details . . . Write Dept. AM-72

22% MORE MAGNETIC AREA . . . WORK PIECES HELD TO EXTREME EDGES OF CHUCK . . . 3 TYPES . . . WIDE SIZE RANGE.

PLASTIC . . . MAGNESIUM . . . FIBRE . . . CARBIDE . . . other non-magnetic materials CAN BE HELD ON MAGNETIC CHUCKS!



*patented

Magna-Vise* MAKES IT SIMPLE!

Hanchett MAGNA-LOCK CORPORATION

Magnetic Chucks and Devices

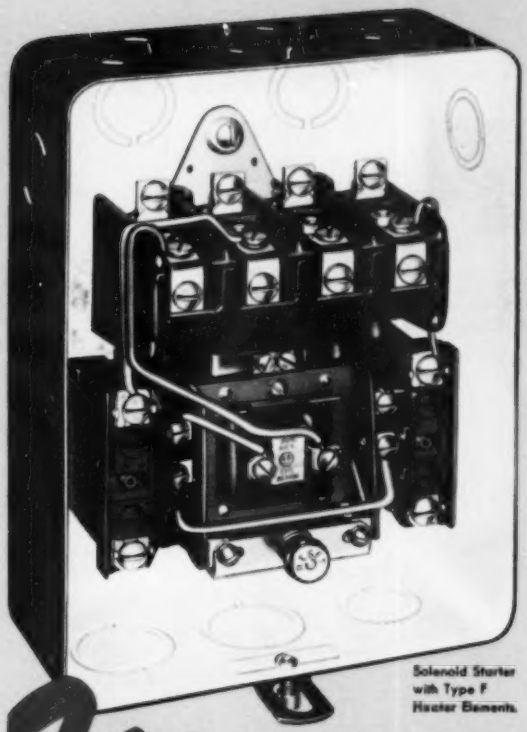
BIG RAPIDS, MICHIGAN, U. S. A.

and spoilage with resultant losses have in the past been far too high. In order to get around this situation it has been found that "vestibule schools" could be used so that a man working on one operation of a job could put in an hour or two each day learning to do an operation requiring more skill. The plan not only solved the labor supply problem to a large extent but made for sound labor relations. Workers felt they did not have to hunt up a new job to better themselves, but could get the break they were seeking right where they were. And pressure for pay in excess of standard rates was reduced considerably.

Past experience with job simplification has demonstrated that upgrading and within-the-plant training as part of the program should also embody one essential too often overlooked. And that essential is the setting up of a clear-cut promotion policy. This should be thoroughly understood by every employee, so that each man working on a job will know how much the job ahead of him pays and what he has to know in order to get a chance at it. The policy should not be left for foremen alone to explain to workers; foremen are sometimes inclined to hold men on an operation once they have learned how to do it well. The policy should be published in an employee manual and thus made a hard and fast part of the working understanding.

As far as splitting jobs by degree of skill being unfair to apprentices, it is believed that a carefully planned and supervised program of apprenticeship training will not be adversely affected by job splitting. Apprenticeship training requires teaching skill on the job, and related or background information. Coaching an apprentice to do work cor-

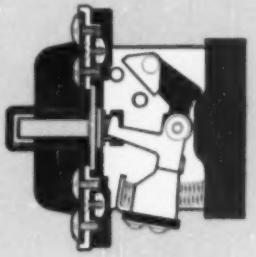
"Remember, Boss? Two weeks ago I told you the shop was out of paper towels."



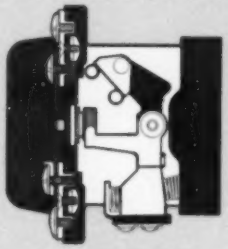
Solenoid Starter with Type F Heater Elements.

THERMAL OVERLOAD RELAY WITH CONVENTIONAL DUAL UNIT

Ordinarily, A-B overload relays have a soldered ratchet spindle (yellow) that is separated from heater strip (red). Heat radiated by overload heater melts solder on spindle and releases ratchet.



THERMAL OVERLOAD RELAY WITH SUPER-FAST COMBINATION UNIT



New, super-fast element has soldered ratchet (yellow) brazed directly on heater strip (red), permitting quick transfer of heat to melt the solder and thereby release the ratchet.

New SUPER-FAST COMBINATION UNIT

for protecting hermetically sealed motors used in refrigeration compressor service

Combination Unit
for super-fast operation

TYPE F ELEMENT
Soldered ratchet spindle is brazed to heater for rapid conduction of heat to solder.

Most motors used for hermetically sealed compressors are cooled by the refrigerant circulated over the motor windings. They are worked beyond the limit of air-cooled motors, and have little overload reserve.

To give dependable overload protection to these hard-working motors, Allen-Bradley has added the new Type F quick-acting heater element. Its special construction, described above, makes it respond within a few seconds to any overload, and trips the overload relay before motor burnout occurs.

If you need motor controls that are quick-acting in case of overload, specify Type F combination elements for Allen-Bradley solenoid starters.

Dual Unit
for average operation

SPINDLE

HEATER

ALLEN-BRADLEY CO.
1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY
OVERLOAD PROTECTION

A-B Quality

Pick the right spindle to fit the starting cycle.

Insert the spindle in the A-B thermal overload relay.

The relay is ready for the heater element.

It's so easy to provide Starting and Running Protection with Allen-Bradley Thermal Overload Relays

INTERCHANGEABLE RELAY SPINDLES

TAN SPINDLE—for normal allowable locked rotor time and long starting time.

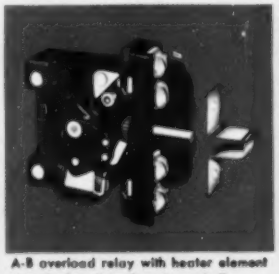
RED SPINDLE—for normal allowable locked rotor time and normal starting time.

GREEN OR GRAY SPINDLE—for low locked rotor current and short allowable locked rotor time.

SUPER-FAST SPINDLE—for low locked rotor current and extremely short locked rotor time.

FIRST—to provide locked rotor protection—pick the overload relay spindle (see pictures at left) that matches the motor characteristics. There is an Allen-Bradley relay spindle to meet every need.

SECOND—to provide running protection—pick the heater element (see pictures at right) to fit motor full-load current. There is an Allen-Bradley heater element for every rating. This two-way protection is standard for all Allen-Bradley solenoid motor controls.



A-B overload relay with heater element detached to show the relay spindle.

A-B overload relay with heater element mounted in place over the relay spindle.

INTERCHANGEABLE HEATER UNITS

LOW RATING

MEDIUM RATING

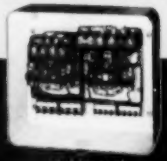
HIGH RATING

ALL ALLEN-BRADLEY SOLENOID MOTOR CONTROLS HAVE TWO-WAY OVERLOAD PROTECTION

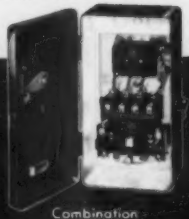
Manual Starter

Automatic Starter

Reversing Starter



Multispeed Starter



Combination Starter

5-52-MR

A-B Quality

ALLEN-BRADLEY

SOLENOID MOTOR CONTROLS

QUALITY

ALLEN-BRADLEY CO.
1316 S. Second Street
Milwaukee 4, Wis.

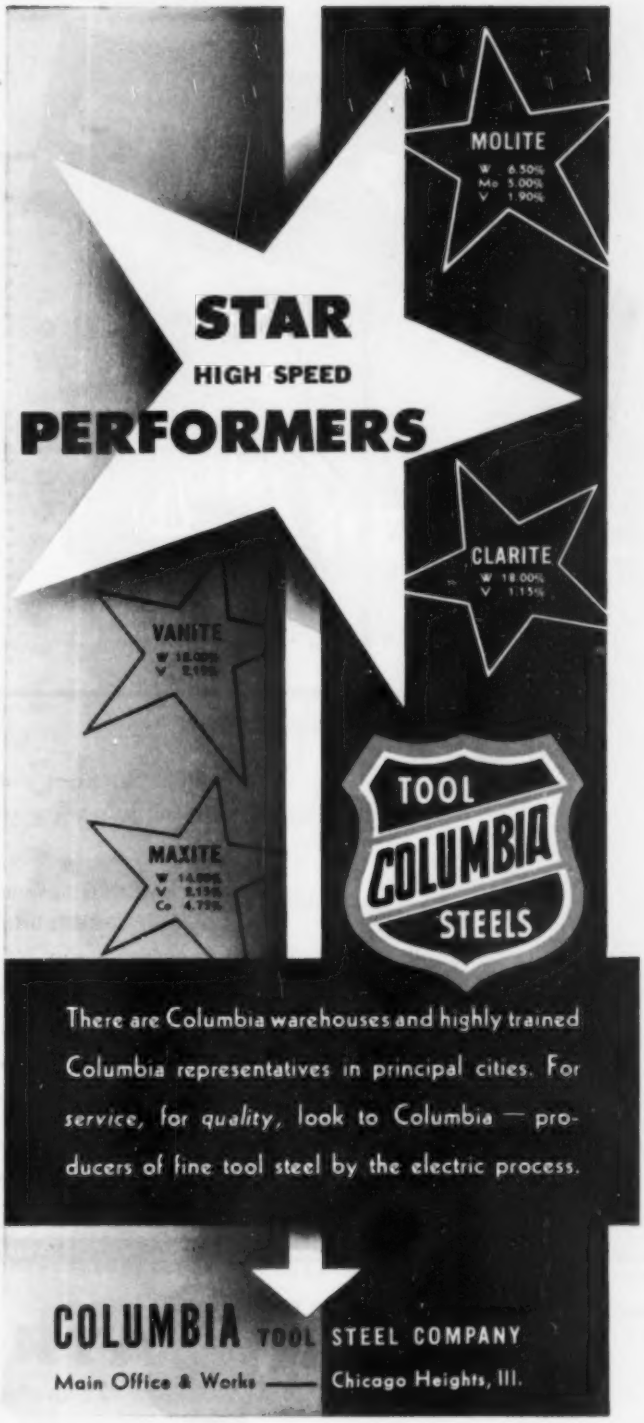
rectly should be done by one who knows how to teach as well as do the specific job. Even men who know how to operate a machine may not be able to convey the fundamental points to the trainee. First, the facts to be learned must be determined, then how the teaching of these facts is to be accomplished.

An effective apprenticeship program involves the selection of good teachers to work with management in the training of apprentices. A good teacher must be a natural leader, and must enjoy showing others how to do the work. Some workers are reluctant to disclose what they call "trade secrets." These men should never be used as teachers.

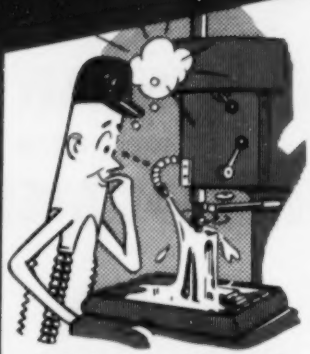
Each shop assignment of the apprentice should be analyzed in outline form. The apprentice should receive this analysis when he starts on the job; from it he can tell what he is expected to learn on that job. The apprentice should be graded on each assignment by the sub-foreman in direct charge of the job. The performance report on each shop assignment should be filled out by the sub-foreman in charge of the job on completion of assignment and should cover workmanship, industry, mechanical judgment, and deportment. Where performance reports indicate unsatisfactory work, apprenticeship agreements should be terminated. All regular shop training should be given in the plant, with foremen, assistant foremen and set-up men as instructors.

Splitting jobs by degree of skill can be practical. In reality, this is just another way of promoting men within the plant to do jobs that require more and more skill with each promotion. The first step in upgrading personnel should be to analyze each job requiring a skilled operator, to see if it cannot be broken

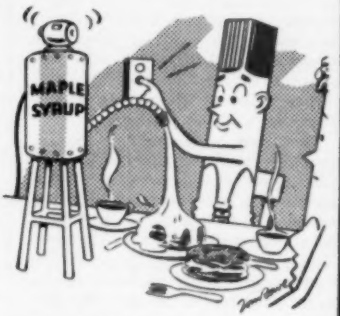
"Freezing cold outside and this guy with a heater behind him insists on keeping the door open!"



TAP-ODDITIES



Production Pete would "get ideas"—
In the shop, they called him "sappy".
But like every other genius
He was just a bit "tap-happy".



Instead of coolant, on the work,
Now Pete gets all the breaks.
With a constant flow of syrup
On his daily buckwheat cakes!

Are you "tap happy"—that is, are you happy about the efficiency of the taps you are using in production?

You don't have to be a genius to discover the superior qualities of BATH "ground from the solid" taps. A trial will convince you that Bath Taps are uniform . . . will cut threads of high quality and perfect accuracy . . . will keep the cost per threaded hole down to a minimum!

Bath Taps are available in many stock sizes and types . . . and experienced Bath engineers specialize in the design of custom built taps for unusual jobs.

Insist on Bath "ground from the solid" Taps and you'll always be "tap-happy" about your production schedules.

INSIST ON BATH TAPS
— PROFIT BY THEIR
PLUS— PERFORMANCE

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

down into a series of simple, semi-skilled jobs. One job previously requiring a skilled operator, after analysis, may be found to be able to be broken down into several different operations, each one simple in itself. An apprentice, after a little training, could be put to work doing just one of these operations. Upgrading could be accomplished by shifting an apprentice or semi-skilled operator from one operation to another until he has learned all the elements involved in the job. He would thus have the opportunity of becoming skilled in the variety of operations, and, in addition, would have been producing while learning.

However, it is necessary that the apprentice, when assigned to the operation, be given a qualified instructor. One of the disadvantages of the informal, old-timer-to-student basis of apprentice training is that the instruction is limited to the ability of the mechanic as a teacher. Frequently the experienced operator who is doing the teaching knows the job so well that performing it has become automatic or second nature to him. He is not able to understand, appreciate, or have patience with the beginner's confusion and difficulties in understanding. For the same reason, unless he is trained to do so, the experienced operator cannot make an effective job outline for instruction purposes or put himself in the learner's place and at the learner's level.

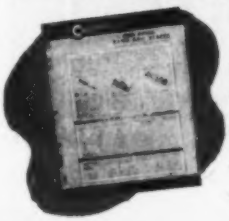
It is therefore believed that job splitting by degree of skill, and utilization of apprentices for the lower skilled operations of the job, can only be practical and equitable to all employees if an adequate promotion system is employed for advancement in skills, and an up-to-date apprenticeship system assures the apprentice of supervised train-

CAPEWELL MAKES EVERY TOOTH COUNT

1881 CAPEWELL

BAND SAW BLADES

YOU CAN'T BUY BETTER BLADES !



THE CAPEWELL MANUFACTURING COMPANY
65 GOVERNOR STREET • HARTFORD 2, CONN.

Please send me your bulletin on Band Saw Blades.

Name _____

Company _____

Address _____

City _____ State _____

8CABB

MEASURE IN MICROINCHES RMS

Precise Surface Finishes *assured*

because DoALL uses the PROFILOMETER

The DoALL Company of Des Plaines, Illinois, world famous manufacturer of machine tools, gages and cutting tools, gives customers an exclusive analysis of the precision and dependability of each DoALL Precision Surface Grinder.

To do this, DoALL relies on the Profilometer as the final check made on every grinder manufactured.

Rigid tests provide that each DoALL grinder before completion must grind a sample block of steel using a standard 46-grit wheel and have the resulting surface finish measured by the Profilometer. This Profilometer test on the steel block must register a finish of less than 10 microinches r.m.s.! These records of surface finish with the actual steel block are then attached to each grinder prior to shipment—thus assuring purchasers of the exceptional precision of each grinder.

As a shop instrument the Profilometer is widely being used throughout all industry where surface measurement is needed in machining, grinding or other sizing and finishing operations.

The Profilometer provides the fastest, simplest and most versatile means of obtaining dependable roughness ratings for all surfaces from a fraction of a microinch to 1000 microinches r.m.s.

In your plant, too, the Profilometer can offer exceptional advantages as an all important shop tool.

To learn how the Profilometer can help cut costs in your production, write today for these free bulletins.

Profilometer is a registered trade name.

MICROMETRICAL MANUFACTURING COMPANY
formerly PHYSICISTS RESEARCH COMPANY
Instrument Manufacturers
ANN ARBOR 4 MICHIGAN

ing in acquiring the higher degrees of skill required for all the operations of the entire job. Keeping the apprentice indefinitely on a simple operation will not assure the continued growth of a skilled and efficiently trained working force.

Harry Kaufman
Philadelphia, Pa.

•

TO EACH HIS OWN

THERE'S NOTHING more relaxing for one's nerves than a nice, long roughing cut that eats up considerable time and enables one's troubled brain to shift into neutral for a refreshing interval. Pampering one's brain however runs into money.

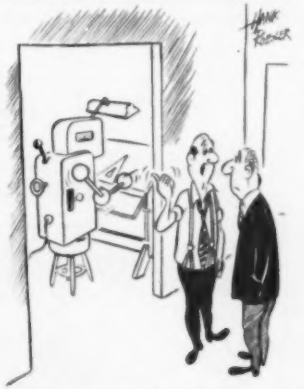
To turn over all roughing-out jobs to apprentices so that the skilled man can be relieved of considerable time necessitates doubling up of many operations which in turn become time consumers in themselves.

There is no doubt that the skilled man could be saved considerable time if he were relieved of roughing operations. Herein Al's idea has value.

But I'm afraid that Al would run into a touchy chap now and then who would object to anyone but himself having anything to do with his job, especially in depriving him of the joy of that pacifier of wrought up emotions—roughing out.

I cannot see where roughing-out work would be an imposition on apprentices in the earlier period of their training. Through these jobs the youngster could gain considerable experience of a kind—especially manipulative. I'd dislike to see an apprentice kept on this type of work too long, as he could easily develop careless habits.

Were such a scheme put into operation, I would have the skilled man



"How do you like that! I invented a tool-designing machine that takes the place of me!"

take the youngster under his wing and dish out the work to him. Still, the question arises: does the time necessary to supervise the apprentice on these jobs greatly offset the saving of time for the expert?

The progressive youngster resents too much of the roughing out experience and yearns to get into the higher bracket in which skillfulness plays a part. You can frustrate an apprentice by imposing too much on his valuable time, which, by the way, should be utilized in acquiring skill.

J. Homewood
Ontario, Calif.

•

SICK ON SCHEDULE

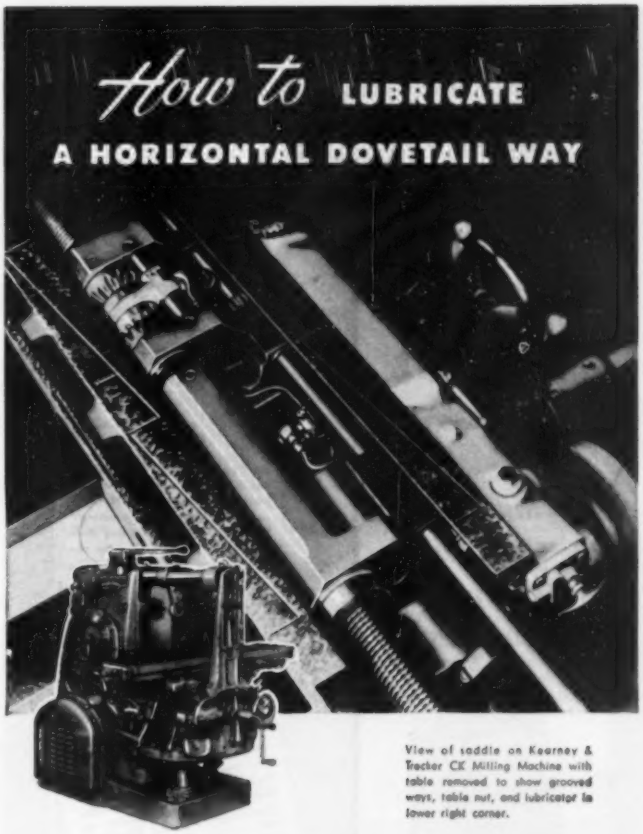
Is "sick leave" a good thing in the shops, or has it developed into an extra paid vacation? Are companies being taken advantage of by workers who use the days for their own special benefit, not waiting till ill-health may necessitate their use? Do you agree with our readers? . . .

SURELY SOME SORT of recognition should be given the man who has a physique like a rhinoceros, but this should not be in the form of a pseudo-sick leave. A man who curls himself up on his favorite chaise longue and slowly turns the pages of some magazine as he says, "to hell with the shop for today; I've got it coming to me," just because he works for a firm that allows a certain number of days with pay for minor sicknesses, is, to any fair-thinking individual's mind, a clear case of unadultered brass.

There is no doubt at all that this attitude defeats the purpose of sick-leave with pay and can easily result in the privilege being removed entirely. It is unfortunate that we are not all blessed with a tough hide like Jones—to be able to deflect the troublesome bugs from our person with ease.

I am working today with a fellow who has never suffered with a headache in his whole life—I can't recall his having lost a day from work for the past thirty-two years on account of illness. Surely that fellow has something as an asset to anyone who employs him. He has ten days of sick leave with pay—accumulative to forty days—but he has never used a minute of it, justly or unjustly. The chap just couldn't pull a Jones, I'm certain, because he's a super-square shooter in every respect.

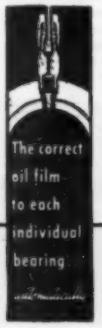
I like the idea of allowing a few days for sickness; it's good for the worker and his employer. It seems so unfair to the wage earner to have



View of saddle on Kearney & Trecker CK Milling Machine with table removed to show grooved ways, table nut, and lubricator in lower right corner.

. . . as KEARNEY & TRECKER does it with a **BIJUR SYSTEM**

To maintain a constant oil film between the table and saddle ways and also between the saddle and knee ways was the problem here. Both problems were solved by building a lubricator into the saddle . . . controlling the oil flow thru a system of meter-units at all four ways and both knee and table nuts . . . spreading the oil evenly over all way surfaces thru "Z" grooves in the saddle ways. This is another example of Bijur "teamwork for bearing protection." For aid in solving your lubrication problems, call in a Bijur engineer.



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BIJUR
LUBRICATING CORPORATION
Rochelle Park, New Jersey

VLIER

TOGGLE PADS

Simplify Clamping On Uneven Surfaces

Wherever clamping is done, the Vlier Toggle Pads are practical necessities. These tools will operate with almost any type of clamp or jack, and insure accurate holding because of self-aligning and leveling feature.

Each pad has a 20° (included) angle movement for permitting adaption to uneven or off-angle surfaces. A special "jamming" feature prevents loosening during work, yet allows easy removal from clamp or jack.

All Toggle Pads are made of the finest cold-finished steel, accurately machined for trouble-free performance. Smoothly relieved—gives instant alignment with no "dead" spots. Polished base provides secure seating on any surface at any angle.

Vlier Toggle Pads are available in five sizes. Precision manufacture provides trouble-free service. Like all Vlier products, these units are economically priced, fully guaranteed. There is a local Vlier distributor to serve you.

VLIER MANUFACTURING CO.

4552 BEVERLY BLVD., LOS ANGELES 4, CALIF.

Manufacturers of

Torque Thumb Screws, Spring Plungers, Spring Stops, Fixture Keys,

to suffer being docked when the salaried man can pull a halt for anything from an ingrown toenail to a hot seat.

If the worker were dealt with drastically, as he was in the days when dog ate dog (pre-productive science days in which the interests of the worker were completely ignored) and no allowance made for illnesses which he could not avoid, there is the chance that he would be inclined to take too many chances with his health and expose others.

J. Homewood
Ontario, Calif.

•

IF WE ARE going to run industry on kindergarten lines, time off for good behavior is an excellent idea; in point of fact, given normal kindergarten conditions in the workshops, it is the only worthwhile line to take.

The nice, good ones are coaxed and coddled, only the really nasty, wicked ones are mildly reproved.

But if industry must be run on kindergarten lines why stop at time off for being good? Why not some positive reward? Time off seems so negative, unimaginative and unsatisfying.

Why not do the coddling in style? Why not, say, a distinctive dress for being good? Big Jock, the planer, would look well in tartan, swanking it around in a kilt and all the others green with envy, wondering what special, hitherto unthought-of brand of goodness they could perform to do one better and perhaps qualify for, say, a cowboy suit. Ned, the grinder, would look swell in a cowboy suit and if the naughty millers, drillers, erectors, etc., jeered at him

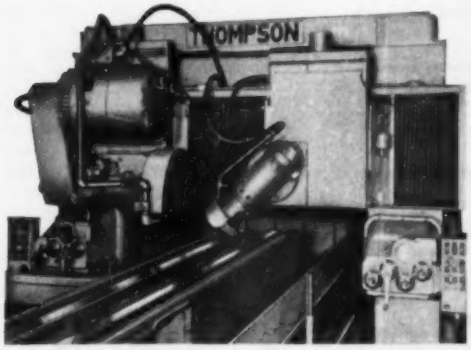
"I'm resigning to join a union and get in on some of these raises!"

New Thompson Way Grinder Developments

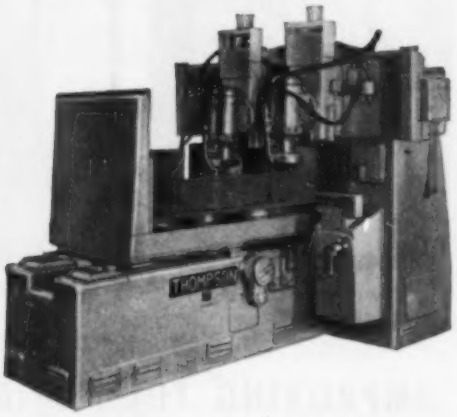
Reduce Costs ...Speed Machine Tool Production

Way Grinders now available with single, multiple heads, or combinations of horizontal and vertical heads and in sizes to meet all requirements.

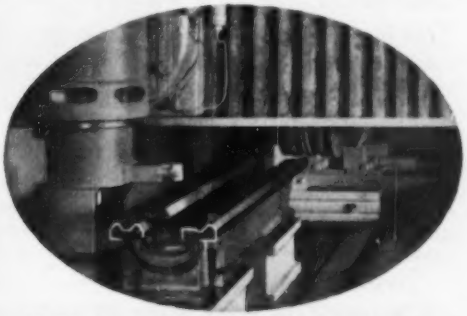
Thompson has produced machine tool way grinders in many types and sizes that have eliminated hand-work and produced economical and accurate ground ways. However, recently increased production grinding of ways has been made possible by many new Thompson Way grinding developments such as: automatic grinding and truing cycles; dual vertical or horizontal heads for grinding ways different heights; horizontal multi-wheel grinding and vertical side and undercutting head; Hydrail way grinding for giant columns or bed ways. Three of the new Thompson Way Grinders are shown here.



Designed especially for extremely large machine tool way grinding is this typical Thompson Hydrail Way Grinder. Size 48" x 48" x 192". Part: grinder bed ways.



One of several new Thompson Double Head Dovetail Way Grinders installed to speed work and hold accuracy in the plant of a leading lathe manufacturer.



Multi-wheel grinding with auxiliary vertical head. Equipped with horizontal spindle having dual spaced wheels and auxiliary inclinable spindle. The front contoured grinding wheel grinds the rear set of ways and the rear grinding wheel grinds the front set, with vertical head grinding the sides and undersurface of the ways and rack seat.

Write for details Today.

The Thompson Grinder Company, Springfield, Ohio

Thompson SURFACE Grinders

Copyright 1952—The Thompson Grinder Co.

One copy of triplicate Tool Room Order is filed on Wall Board at left under employee's clock number; second is filed in Cabinet at right with Tool Inventory and Activity Card; employee retains third copy. This simple procedure is basis of control that is . . . .

IMPROVING TOOL CRIB SERVICE IN MODERN DIESEL REPAIR SHOP

Chicago & Northwestern Railroad first installed McCaskey Tool Crib Control when the road's modern diesel shop was placed in service in Chicago.

Tool losses and breakage dropped, their inventory of tools was minimized, and other economies and improvements resulted. Among those reported in a factual article in Modern Railroads are:

. . . . Improved control and faster tool service.

. . . . Recovery of expensive tools, otherwise idle at work benches or in the lockers of mechanics who "want to hang on to them."

. . . . Perpetual inventory of tools and record of frequency of use that provides accurate basis for determining quantity to be carried in crib and adjustment up or down according to requirements.

. . . . Less loss and breakage.

. . . . Production capacity of shops increased with fewer tools and substantially lower tool costs.

Mail coupon today for reprint of entire article, "C & NW Solves Tool Crib Control" and pamphlet presenting step-by-step McCaskey procedure. Control of your tools and gages will save many headaches and dollars in the months ahead.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

Send me C & NW reprint and complete facts on McCaskey Tool Crib Control.

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it would only be envy on their part, knowing, as they would, that they had been too naughty to deserve a nice, new cowboy outfit. For the younger children, say, the under-forties, something more intimate could be thought up. Nice, soft woolen undies or something in pajamas with horizontal stripes. In fact there's almost no end to the variety o finducements that might be offered to make and keep our industrial infants good.

Payment of wages for short-term sick leave, say a few days per year, seems pointless to me since, over a period of one year, so little is at stake such a loss would hardly be noticed in our times when the workers can, each week, spend an enjoyment or on their search for what they hold to be enjoyment, an amount not far short of a pre-war weekly wage. That, roughly, is the position here, in Britain, today.

To my mind, it is the long-term, genuinely sick worker who has a claim on the company's consideration and his fellow-workers' sympathy and generosity. His family must feel the pinch if the bread-winner suffers from long spells of genuine sickness. Apart altogether from humanitarian considerations which, in industry, are important and should on no account be lost sight of, it is good business to look after the health of a not-quite-robust employee if he is a profitable servant when his physical condition permits.

In all plants of any consequence in Britain, qualified doctors and nurses are employed to study the health of the workers and to keep them fit, insofar as preventative medicine and expert professional guidance can. If a patient must stay at home, it is usually on instruction or advice from the works doc-

"There you are, Bill. He says he's a lathe hand—had three weeks of it at school!"

tor, so the question of feigning sickness does not arise in any acute form with us. In addition, as part of our national health service scheme, each employee has a health service doctor who is required to grant a certificate of unfitness for each week of sickness, so that opportunities for lead-swinging are few and far between. If there is reasonable doubt in the mind of the works doctor as to whether the patient seems too long absent from work, he can confer with the patient's national health service doctor on the matter. The works doctor comes under the national health service, also, but deals only with patients at work. Every insured person has a family doctor who visits the home during illness.

Is time off for good behavior and guaranteed sick leave sound or just another weak spot in the line? I should say they are both if we regard "sound" ideas as ideas that merely sound good. I should not regard them as practical policies; they really are not industrial policies at all. Rather should they be regarded as confessions of failure to grapple with abnormal circumstances.

What chance of acceptance at the hands of the bosses would they stand if industrial conditions were reversed, were there more men than jobs? This is not a plea for mass unemployment and soup kitchens which don't pay the companies any more than the men, but if world conditions favor the men to the extent of causing a foolish minority to lose their heads and behave as spoiled children, that is no excuse for complete capitulation on the part of the bosses. Something better, more constructive, is expected from them; something better, more constructive must be produced by them if they are to retain the respect and confidence of the rank and file.

Kindergarten and other childish futilities most assuredly will not accomplish that, since such transparent ineptness on the part of the chiefs is really a cause for ridicule and merriment in the ranks.

In this connection, I am reminded of an incident in a large plant where a bright top executive conceived the idea of encouraging competition among the men as a means to greater production. Over the years, it has been abundantly proved that the one sure way of encouraging competition among the men is to make it financially worth their while to compete. But this executive decided on something different; he provided a shield and medals to go to the squad with the highest output rec-

AMERICAN CHEMICAL PAINT COMPANY
AMBLER ACP PENNA.

Technical Service Data Sheet
Subject: PROTECTING FRICTION SURFACES WITH THERMOIL GRANODINE®

INTRODUCTION

Fabricators and product designers, particularly in the automotive field, are aware that even highly polished surfaces under friction weld, gall and score. One of the most inexpensive and practical methods of preventing this is to coat the metal to prevent metal-to-metal contact. With cast iron or steel, the "Thermoil-Granodine" manganese-iron phosphate coating provides a wear-resistant layer of unusual effectiveness.

Thermoil-Granodizing greatly prolongs the life of parts subject to friction. It protects the surface of products like the diesel engine liners shown above and the many moving parts of automobiles and other machines. "Thermoil-Granodine" with its remarkable lubricating properties is particularly valuable in these and similar applications because of its ability to retain oil and maintain lubrication under high pressures and high velocities. This ACP wear-proofing chemical not only permits rapid break-in without scoring, scuffing and welding but also reduces subsequent wear on friction parts.

"THERMOIL-GRANODINE" PROTECTS RUBBING PARTS

Thermoil-Granodizing removes "fuzz" from ferrous metal friction surfaces and produces a coating of non-metallic, water-insoluble manganese-iron phosphate crystals which soak up and hold oil as bare untreated metal cannot do. The oiled crystalline "Thermoil-Granodine" coating on piston rings, pistons, cylinders, cylinder liners, cranks, cam-shafts, gears, tappets, valves, spiders and other rubbing parts, allows safe break-in operation, eliminates metal-to-metal contact, maintains lubrication and reduces the danger of scuffing, scoring, welding, galling and tearing of the metal. The work to be protectively treated is merely Thermoil-Granodized and oiled, usually with a soluble oil.

"THERMOIL-GRANODINE" MEETS THESE SPECIFICATIONS

SPECIFICATION NUMBER	SPECIFICATION TITLE
MIL-C-16232 Type I	Coatings — phosphate; oiled, slushed, or waxed (for ferrous metal surfaces) and phosphate treating compounds.
AN-F-20 (See also U.S.A. 3-213)	Finishes, for electronic equipment.
U.S.A. 57-0-2C Type II, Class A	Finishes, protective, for iron and steel parts.
U.S.A. 51-70-1 Finish 22.02, Class A	Painting and finishing of fire control instruments; general specification for
M-364	Navy aeronautical process specification for compound phosphate rust-proofing process.

CHEMICALS ACP PROCESSES

WRITE FOR FURTHER INFORMATION ON "THERMOIL-GRANODINE" AND ON YOUR OWN METAL PROTECTION PROBLEMS.

CHEMICALS ACP PROCESSES

THERE'S SAFETY IN STRENGTH!

SAF-T-CUT

SAF-T-CUT gets its tremendous toughness from the yards of resilient nylon cord and mesh imbedded with sharp-cutting abrasive particles.

Metal working men, looking for a light weight grinding wheel that will withstand a terrific amount of abuse have found that BAY STATE'S SAF-T-CUT has no equal for heavy duty stock removal.

So, when you specify SAF-T-CUT, you get a peak-performance abrasive product that's safe because it's strong.

Typical applications of this outstanding Reinforced Disc-wheel are: general weld grinding, notching gates and risers, smoothing flame cut plate, mill scale removal.

Write for "Big-3" Booklet on Reinforced Resinoid Products.

BAY STATE

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.

Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario

of many rude remarks and in a short space of time the medals found their way into the several furnaces and the shield was relegated to the works museum. Amusement among the men over the scheme touched its peak when the disillusioned executive assured the skeptics that the shield and medal method was, then, current American practice as a means to stimulate competition and so increase production.

C. D. Mackinnon
Lanarkshire, Scotland

•

VENDETTA

What recourse has a foreman in a shop split by nationalistic feeling? Al thinks making the feuding parties split the same job would solve it, but would it? Is he just postponing the inevitable by not firing the miscreants when production suffers because of their squabbles? Do you agree with our readers? . . .

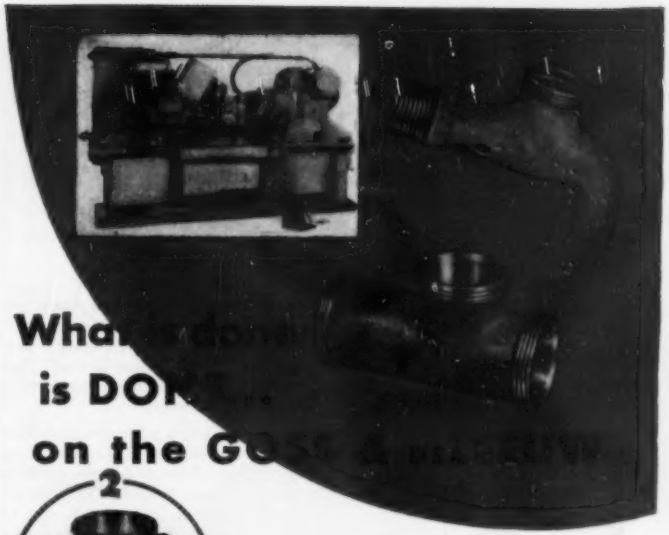
So POOR OLD AL finds himself mixed up in a brawl, eh! What's the matter, fellow, have you no "gots" to wield the big stick? Or has that weapon of supervision gone the way of the dodo?

You're a foreman now, Al, and should maintain a stiff upper lip in order that nothing interferes with production. If you're going to sit idly by while the shop splits up into knife-wielding camps you're going to raise hell with the overhead and use up a lot of emery wheels. This may be your one chance to bring the lessons you learned as a kid into practice for the benefit of the whole shop. Remember the one about being kind to one another? Can't you slip that one in one of the Swede's sandwiches?

Have you ever given thought to having the opposing factions in your conference room for a little discussion of their differences? It's that good quality healthy exposure that removes the odor of belligerency. We are all guilty of kidding in one form or another, but unfortunately there are some who can't take it, and burn with resentment although the party of the first part actually meant no harm whatsoever.

Teaming up enemies may work out and it may not. I hate to see Al made a sucker by having a good piece of work spoiled in the gamble. Al should be more conscientious about whose money he's gambling with.

It shouldn't be necessary for a foreman to be so lenient with his help. They were hired to turn out work, not to rehearse a vaudeville



Wha[illegible] is DO[illegible] on the G[illegible]

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker—provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DELEEUW

GOSS and DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

reducing troubles?

Torrington Swaging Machines offer a means of reducing rod, wire and tubing that improves the quality of the material, gives a better surface, without waste of stock. Hammer blows (4000 a minute) speed production, and give the metal toughness and resiliency that cannot be obtained by any other method.

Write for your free copy of "The Torrington Swaging Machine." This informative booklet gives complete details on the art of swaging and the extensive line of Torrington Swagers.

THE TORRINGTON COMPANY
Swager Department
559 Field Street • Torrington, Conn.
Makers of
TORRINGTON NEEDLE BEARINGS

act on the company time. I'd give them the choice of getting along together or else getting along somewhere else.

We all know what discord can do for production—it's bad enough to have labor and management whetting their slip sticks, let alone the men who are working for the same goal.

J. Homewood
Ontario, Calif.

•

WHO SAYS HOW.

Do job instruction cards limit the skill and ingenuity of the workman? Do they bypass the foreman's prerogative of exact instruction? Our readers write of their experiences with these devices—

MY REACTION to a job instruction card is that the card is a splendid thing for untrained hands to help them to carry out their work—or for instructional purposes in a school—but to be used by a skilled man is going overboard with theory. An experienced worker knows his business. Nine times out of ten he knows the job better than the one who tries to tell him how to proceed with it.

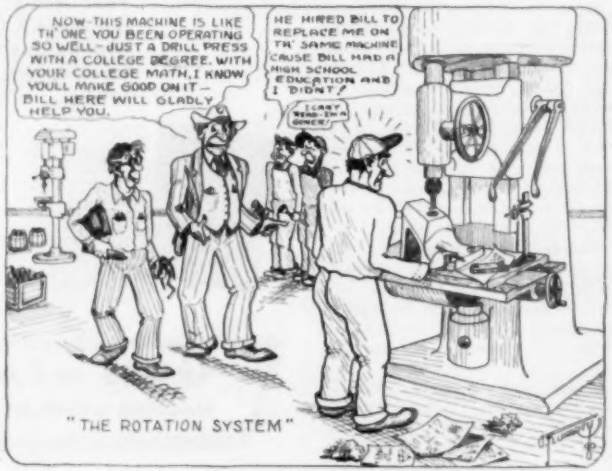
I had an experience one time when I was a young fellow jumping from shop to shop for experience. I happened to get a job in a shop that was run by a unique boss who either had a weakness for going into profuse detail or was too dumb to realize that others knew something about the work they had spent some years doing. It was my first morning on the job and I hadn't done a stitch of work other than put my overalls on and wipe my hands with a piece of colored waste. I didn't like the atmosphere of the place anyhow; it was poorly lighted and on the whole it looked like a junk heap. I had pride! After Mr. Knowitall got through with his prolonged dissertation I lost no time in saying: "I quit!"

I might have tolerated the shop itself but I could not put up with a man telling me so precisely how I was to do a job.

You can't treat a group of men as though they were cast in the same mold and possessed the same characteristics. We are a nation of individuals and pride ourselves on our ability to perform as individuals — to do a job as we think it should be done. We've got to take the worker's pride into consideration and let him exercise his thoughts and actions as his experience dictates. I'll grant you that there are those dishonest few who may plan their work so as to occupy the most time in doing it, but as a general rule you'll find the experienced men worthy and dependable.

To follow instructions to the letter on procedure will ultimately lead to stagnation of thought and will eliminate the possibility of discovering something of value in a different way of doing things. You'll find that most workers will ignore the instruction card anyhow, and do the job as they see fit, or else they'll conform to pressure and sulk through to the end. Believe you me, if there happens to have been a slip-up and a mistake has been made they'll make that mistake knowingly and be tickled to death about it.

We're being dictated to enough now by the champions of the underdog who delight in shoving him down further; let's not become in-


NOW-THIS MACHINE IS LIKE TH' ONE YOU BEEN OPERATING SO WELL-JUST A DRILL PRESS WITH A COLLEGE DEGREE, WITH YOUR COLLEGE MATH, I KNOW YOULL MAKE GOOD ON IT-- BILL HERE WILL GLADLY HELP YOU.
HE HIRED BILL TO REPLACE ME ON TH' SAME MACHINE CAUSE BILL HAD A HIGH SCHOOL EDUCATION AND I DIDN'T.
I CAN'T UNDERSTAND IT!
"THE ROTATION SYSTEM"

What do you do when it takes hours... sometimes days... to change v-belts?

1 **Put one or several maintenance men on the job**

...and pay for repairs while production stands still

2 **Pay overtime**

...and have repair costs eat away your profits

3 **Standardize on VEELOS...**

...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit

Comparison proves the value of VEELOS...

Minimum Inventory—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

Quick Installation—link construction makes it unnecessary to remove outboard bearings.

Complete Adjustability—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.

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V-BELT

VEELOS DATA BOOK

gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

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ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

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MORE PARTS PASSED

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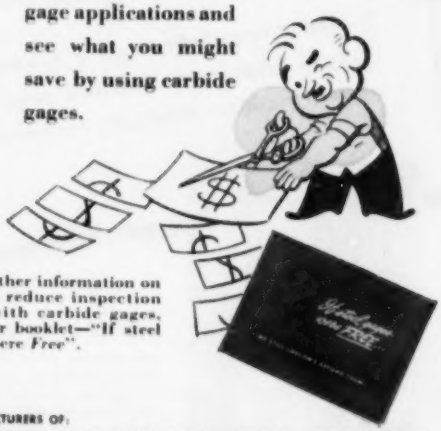
Unbelievable? Not at all; Lincoln Park customers prove these statements with actual records. Take a look at your gage applications and see what you might save by using carbide gages.



For further information on how to reduce inspection costs with carbide gages, send for booklet—"If steel gages were *Free*".

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J. Homewood
Ontario, Calif.

•

IT IS AN EXCELLENT plan to have a written method of the best, up-to-date procedure for machining step by step of all individual parts that go into the makeup of an article of manufacture, thus making a foundation to build upon and to be revised as frequently as any improvement can be made. No person's memory should be depended upon, because such procedure places a strain on the individual who should be free and alert to think up and plan for improvements.

There are many pieces where the procedure of the different operations needs to be done in a certain order for the greatest efficiency.

With detailed procedure already planned, whenever the foreman can find a better or more efficient way, he should be entitled to some additional credit for what had been heretofore satisfactory.

This is a progressive age; what was considered tops yesterday, with new and improved machines and material, may be out of date today.

With work planned as suggested the foreman's work is made easier, and, at the same time, if he is capable of making improvements he should not be deprived of his well-earned reward.

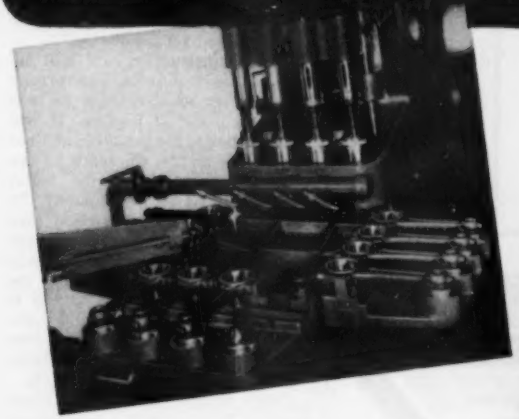
H. B. Martin
Watervliet, N. Y.

•

A JOB INSTRUCTION card will not necessarily limit a skilled worker; it all depends on the worker, and whether he is working on an incentive basis or merely on a time rate. The mental

"I've got 300,000 of these in stock and I want gages made to fit them!"

two machines with a single purpose ...PRODUCTION



Above, four automotive connecting rods have both sides of crankshaft bore chamfered simultaneously. At right is shown one machine drilling four oil holes for camshaft journals and milling keyway for timing gear on automotive camshaft. Both machines illustrated utilize automatic clamping.

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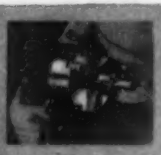

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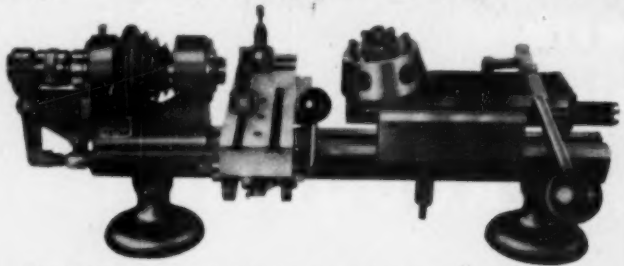
Derbyshire

MAKES THE LATHE THAT MAKES PRECISION PARTS



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attitude of the skilled worker toward work in general will determine whether the job instruction card is, to him, an asset or a liability.

If he is indolent or indifferent, without ambition in the matter of promotion and is working on a time rate, he will never make any effort to improve on the terms of the instruction card; indeed he is more likely to resent the card as a slave-driving device conceived to keep his nose to the grindstone all day.

If the operator is on piecework and has no ambition or imagination, his normal earnings will probably make dull reading and he is likely to accept the job instruction card as final and heaven-sent. To his superficial mind, it does his thinking for him and leaves his unambitious thoughts free to wander at will into realms far removed from honest work. Nothing short of actual necessity will ever make his kind get a move on.

The job instruction card will appeal to the ambitious, enterprising time worker as something he will get a thrill out of beating. It will act as a spur to his initiative and put him on his mettle; the more he can improve on its terms, the better pleased will he be with himself. To his mind, the job instruction card will be a success since it will save him the trouble of preliminary thinking. It is a certainty that the time thus saved will be turned to good account by the keen and interested worker in an effort to improve on the directions and, incidentally, enhance his promotion prospects.

Every worker knows how much easier it is to execute a commission when a lead is given; even an ele-

"Inasmuch as our tooling program of $175,000 has been found to be improperly designed, it is suggested we alter the machine to fit the tools!"

mentary lead is better than none. The terms of the earlier job instruction cards are sure to be shot to pieces by the competent, enthusiastic pieceworker. He will see in them the road to a bulkier pay envelope and more desirable extras for his wife and family. The oftener it is beaten and the terms revised, the more difficult will the challenge become, but to a determined, competent operator saturation point is never just round the corner, it is more often on the distant horizon. When that point is reached, the instruction card will have fulfilled its highest purpose and the top-grade performers will then realize that the "ultimate" has been accomplished by first indicating the "possible" on a job instruction card. If the skilled worker is a flyer, the job instruction card will not limit his potential or cramp his style; it is more likely to expand his potential and increase his resourcefulness.

Job instruction cards cannot bypass the foreman's prerogative of exact instruction. They are not an alternative, though they can be an aid. They don't teach operators how to do operations; broadly speaking, they merely tell them what operations to perform and in what sequence. They are impersonal, inanimate things; they cannot be questioned and they cannot pull up the operator if his interpretation of their terms is at fault. That is where the foreman comes in. He provides the personal and master touch by satisfying the operator's need for advice and by getting him back on the rails when he observes him going astray. Example is always better than precept, and if the foreman knows his job he can demonstrate a movement or an operation if need be.

Fit and finish, for example, are relative terms and are variously interpreted by different people. If the foreman knows his stuff as he should, a few words from him on both these matters will result in a measure of uniformity that the job instruction card could hardly equal. The job instruction card tells the operator what to do and, in some cases, how to do it, but it cannot do anything about it if the operator, consciously or unconsciously, departs from the written word.

This is important when considering whether the card can oust the foreman in the matter of detailed instruction.

Knowing the product he is handling, it can be taken for granted that the percentage of scrap per man/machine hours will be considerably lower if the foreman is in on

get more uniform
work pieces from
PROPER MACHINE TOOL
TEMPERATURE CONTROL!
NEW
OIL COOLER
specifically designed to
control temperature of
production machinery
Your problems of getting high production from your machine tools will be considerably lessened by the use of this new Oil COOLER. It has proved in actual production jobs that it can, through refrigeration, control the temperature of cutting oil or coolant, lubricating oil and hydraulic oil.
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For complete information about "803" metal, the "600" series alloys and TUF-STUF, write today to

82

MUELLER BRASS CO. PORT HURON 18, MICHIGAN

the job instruction than if the card alone held the field.

My experience of the job instruction scheme convinces me of its worth as a *help* to the foreman, a robot assistant-foreman, if you will, but it is no substitute for a foreman in the matter of instructing.

I cannot agree with Al that things will be more standard with the card. They would be if every one interpreted the instructions alike, but that is too much to hope for.

C. D. Mackinnon
Lanarkshire, Scotland

•

WHEN THE CAT'S AWAY

Must designs be followed regardless? Should an underling take it on himself to change a design, even as an improvement, without consulting someone in authority? Our readers' thoughts on the subject—

IT IS EVIDENT that Al and Ed's firm has never heard of a suggestion system. Instead of incurring the displeasure of the designer of the milling fixture under discussion, how much simpler it would have been for Merrill to send through a suggestion incorporating his ideas. Since, in the absence of the toolroom foreman, the regular suggestion procedure might have been too slow, Merrill could have appealed for speed to the head of the suggestion system without hurting anybody's feelings.

It is a sad commentary on the efficiency of a company when a good, conscientious man cannot bring out an idea without running into all kinds of complications.

Of course, Merrill is in the wrong in changing a design without consulting the designer. If everybody along the line decided to act this way, anarchy would not be long in arriving. At the same time, knowing only too well the intransigeant attitude assumed by heads of departments who think they own the the roost, it is necessary to have some method as impartial as humanly possible to act as a go-between.

And a honest suggestion system so far seems the answer.

To start with, no personalities are involved in the discussion; the suggestion is known by a number until adopted or until the suggestor agrees to make himself known if the clarification of his idea requires it. This at the beginning puts the whole problem on a level where its merits are the only criterions.

The group organized to consider

* CM COMET Electric Chain Hoists are now available in two models . . . Push Button Control or Pendant Rope Control. Designed for production line applications. Anyone can operate. One hand control, fast load spotting, flexible Herc-Alloy steel load chain, upper and lower safety limits, low power consumption, lifetime lubrication and fully enclosed working parts are just a few COMET advantages.

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The **MASTUR adjustable boring head** takes **heavier cuts at higher speeds.** Adjustable to 0.0002-inch, this tool handles both **rough and finish operations** on boring and milling machines as well as automatics.

Small and compact, the **MASTUR** precision boring head can be inserted easily and positioned rapidly. Both body and block are made of heat-treated alloy steel. Tool block is dove-tailed into body, and all fitting surfaces are ground to assure precision fit and **long service life.**

Adjusting screw head is graduated into 50 divisions to provide readings in **thousandths,** and body is graduated to permit vernier readings of 0.0002-inch. Three models are available having maximum boring bar capacities of ½, ¾ and 1 inch, with boring range from ⅜ to 15 inches.

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THE MAXWELL COMPANY

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the suggestion would vary according to the subject. In this case, the production foreman, the toolroom foreman, the designer, the methods man (if existent) should be sufficient to decide on the adoption, with the shop superintendent as an umpire if necessary.

If the suggestion is any good and is adopted, which means that it is going to save money for the shop, it is only fair to show the appreciation of the company in the form of a reward to the suggestor. To eliminate any taint of favoritism, a money reward can be based on the saving effected, as calculated by the cost department. 10% of the yearly savings has been found fair to the company and the suggestor, as changes in design or methods may cancel all the advantages of the new tool.

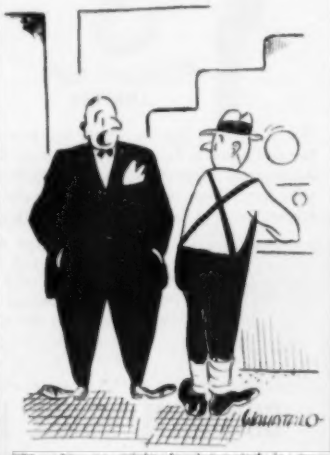
Sometimes it may take quite a long time between the suggestion and the reward, but if the suggestor is kept abreast of the progress, he will feel like making other suggestions, and Ed will be able to take time off without fear that the department will blow up during his absence.

P. P. Fenaux
Lynn, Mass.

•

OH! IT IS A JOY to get the best of both worlds and it would seem that those who desire it most and snatch at it, are the least fitted to possess.

When the firm appoints a man to design what is necessary and arrange for production, the Merrills, starting in where the other fellow left off, think they can do better and, while



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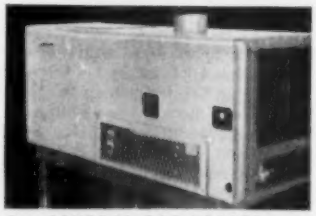

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For years the protection of combustion chambers and outer coverings of heating equipment has been a problem.

The John Zink Company, a leading manufacturer of gas heaters, solved this problem with SICON.

SICON protects their combustion chambers against extreme high heats of 875° without powdering or losing its color.

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Inside and outside—SICON is the finish that can often do the job where all others fail.

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Waukegan, Illinois

ENAMELS · SYNTHETICS
LACQUERS · VARNISHES

the chap's back is turned, without a word to anybody, proceed to do as they think fit and feel as clever and as good as did Jackie Horner of nursery rhyme fame.

There will be occasions when a Merrill may make a notable improvement, too good to be missed, but even as one swallow does not make a summer, its casual appearances could hardly be used as a basis for production programs.

What is the remedy? Try and get a designer who has all the essential brains in the world under his particular hat—perhaps Merrill himself—or try to teach the Merrills to be neither pigs nor prigs and to remember that, in any case, they are but pebbles on the beach.

A man who is neither pig nor prig, will recognize the existence and positions of others and will consult rather than ignore them. If he can and will do this, he may make the place where he works a little less uncongenial and maybe a little more efficient.

Efficiency is not at its highest in snarling surroundings and when the usual liaison breaks down, the remedy may be, metaphorically, just to knock their heads together. Most businesses are too important to be at the mercy of "clever Dicks," however clever these may be.

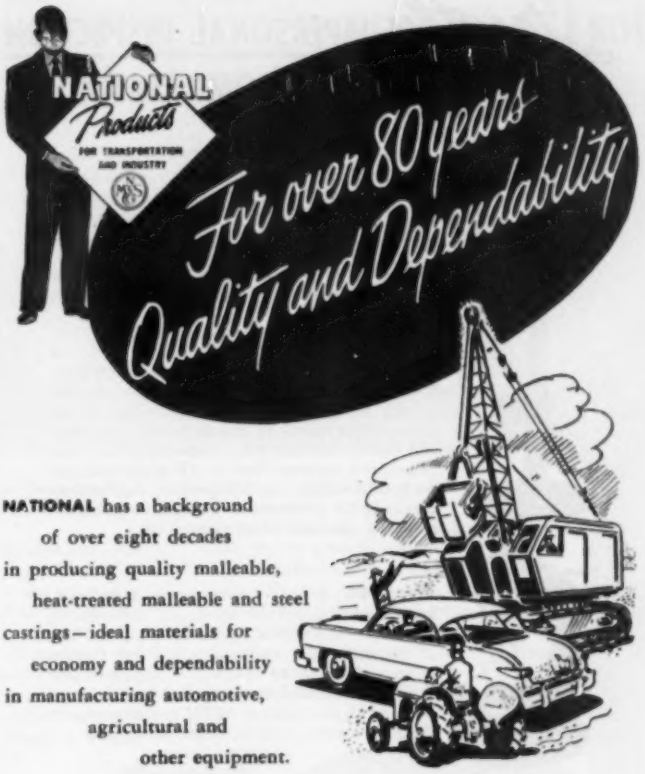
P. E. James
Lincoln, England

•

IN MOST CASES, designs must be followed by the shopman, regardless of immediate consequences, if only to prove their worth to the company. But that does not mean that the original design must be slavishly followed, indefinitely, just because it was thought up in the design section. The few isolated cases where the design is so much out of harmony with its function as to be obviously making for only moderate production in the shops, need not be considered here.

Every progressive company wants good ideas and every progressive company is willing to pay for them today. The suggestions box is bait for any hook and one need not be a design engineer to spot a weakness in a design or to suggest an improvement calculated to give that little bit higher finish or those two or three extra parts per hour. The design engineer who cannot bear to hear anyone criticize his conception is foolish and is not really a profitable servant of the company. In fact, he doesn't quite know his job.

In the matter of detail production, the machine shop is the nursery of



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Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy – the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

Check the Ames Dial Comparators shown – one of them may solve a Quality Control problem for you.

Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.

Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials – sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.

Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.

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ideas for improvement in jig, tool and fixture design. After a reasonable tryout with a given fixture it is a relatively simple matter to spot weakness in design, if such is present. This is not to say that credit is not due to the shopman responsible for the suggested improvement, but rather, to emphasize that no discredit is attached to the design engineer when a bright lad in the shops, as a result of his operating experience, puts over a good suggestion on him.

In a well ordered works, liaison should not break down completely. In the case of the chief being absent, as was Ed, a competent understudy should be available to deal with all matters concerning the shops. This problem of the relationship of the design engineer with the shops is an old and thorny one, but given a team spirit within the company and a good measure of give and take, there is no reason why it should be a major headache or even a stumbling block.

High-handed action is not confined to the shopmen, of course, but in this case, Merrill the toolmaker, was indiscreet, to say the least. It is not just good enough for an employee to alter a design without so much as "by your leave." The organization would soon become chaotic if such action became general, and, unfortunately, bad practices tend to become very popular if they are allowed to pass unchallenged.

Merrill should have sold his idea to the second in command and, if agreement could not be reached, he would be entitled to ask for an opportunity to explain his scheme at a higher level. Merrill's explanation

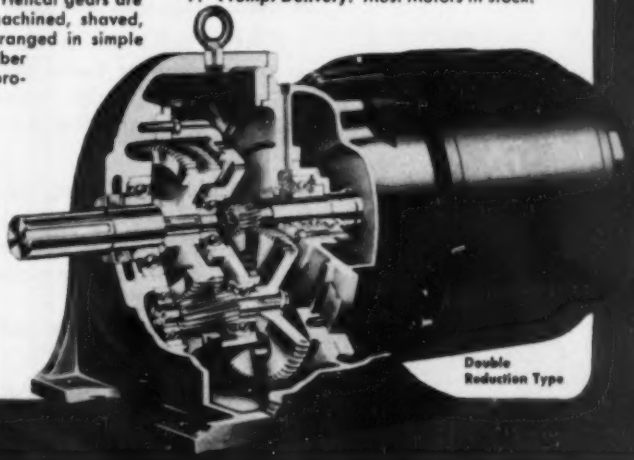
"Cheseton, old boy, no wonder we're losing money! Signing a contract like this—where were your eyes?"

9 POINTS

PHILADELPHIA GEARMOTOR

1. **Compact.** Designed to conserve greatest space without sacrificing strength or accessibility.
2. **Simplified Assembly.** Motor and gear unit each self-contained and readily separated. In multi-reduction units, gears may be inspected without disconnecting unit from driven machine.
3. **Balanced for Strength.** Gear unit designed to provide high operating stability.
4. **Quiet, Long-life Gears.** Helical gears are alloy steel, precision machined, shaved, wear hardened and arranged in simple train to minimize number of moving parts and promote quiet operation.
5. **Bearings.** Anti-friction bearings used throughout.
6. **Motors.** Reliance Precision-Built A-c or D-c Motors provide dependable power.
7. **Positive Lubrication.** Splash system with large oil reservoir assures constant lubrication and cooling of all parts.
8. **Standardized Construction.** Interchangeable stock parts simplify assembly and maintenance.
9. **Prompt Delivery.** Most Motors in stock.

For fast application of electric drives to individual machines the Philadelphia GearMotoR offers economical, efficient and dependable performance. They are available in single, double and triple reductions with a wide range of speeds: 780 through 7.5 r.p.m. Motor ratings from 1 h.p. through 60 h.p. For full details write on your business letterhead for Catalogue GM-48.



Double Reduction Type

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

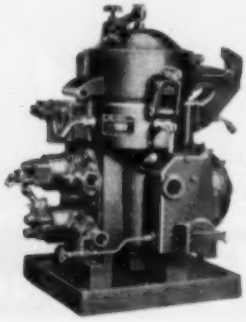
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

DE LAVAL OIL PURIFIERS SAVE MORE THAN THE OIL

When factory oils are purified by means of a De Laval Centrifugal Oil Purifier, impurities and water are instantaneously removed. The oil can be used safely over and over again.

Equally important is the effect on the tools and on the work. De Laval purification of cutting oil, for example, greatly increases tool life, reduces machine "down time" and insures more consistently accurate work.

Hydraulic oil, slushing oil, honing oil, parts washing solution and general lubricating oil are among the factory oils that can be purified profitably by De Laval centrifugal machines.



• *Write for Bulletin FF-25*

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

for more dependable power production

for not taking this sensible course—"didn't want to get mixed up in a high-level argument with another department while Ed was out of town—" does not seem convincing to me, sounds more like an excuse than a reason. As an alternative, the matter could have been held over pending Ed's return to the shops.

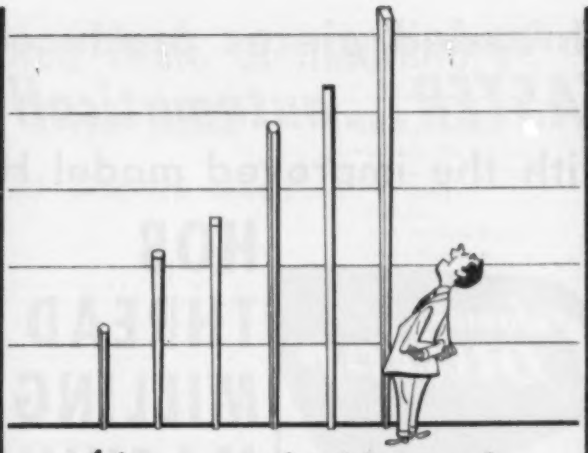
A well founded "suggestions scheme" would have met the case and saved all the trouble; it would have given the whole matter an official standing which none could have objected t , not even the design engineer. It would, or should have satisfied Merrill that he had, at least, set the proper machinery in motion and that his suggestion would be sympathetically judged on its merits, with the certainty of financial reward if the idea caught on.

My opinion is that toolmaker Merrill is no mouse. He seems to be a valuable man with confidence in his own ability to make a valuable contribution to the ideal of maximum production; that is all to the good. He committed a grave indiscretion in taking matters into his own hands, but for Ed to "bawl him out" would likewise be a mistake. It would also be wrong to pass the incident over without comment.

Were it my lot to handle this case I would suggest a cash award to Merrill in line with the considered value of his suggestion. A quiet talk with him regarding the right and wrong way of going about such matters in future might cause him to think twice another time. Such a talk should be friendly but should impress on him the importance to all concerned of carefully observing the rules laid down for the successful conduct of the company's affairs. It should be made abundantly clear

"You'll have to get somebody else stamping out those buttons. I heard they're for Republicans, and I'm a Democratic committeeman."

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE ROUNDS SQUARES FLATS HEXAGONS OCTAGONS



BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

things are looking up!

Yes, steel supplies *are* improving tonnage-wise! Even alloy steels are in better supply. However, the continued scarcity of many alloying materials makes certain grades of alloy steel still unobtainable, and substitute grades must be used.

Chances are, we can supply your needs . . . but if we can't, perhaps we can suggest and supply the substitutes best suited for your particular requirements.

Or possibly we can suggest alternative methods of manufacture, or variations in your present methods of treatment.

Your nearest W-L office will be delighted to be of service. Call them today!

Get in the SCRAP! . . . every pound means more steel for you!

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

WHEELOCK, LOVEJOY & COMPANY, INC.

Warehouse Service

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Threaded pieces produced *FASTER... automatically* with the improved model H1

James Coulter

HOB THREAD MILLING MACHINE

Here is the ONE machine for exacting threading as required in today's speed-up of production. Only the Coulter provides even greater ranges of speeds and feeds — high speeds for non-ferrous metals, slow speeds for heat treated materials. A special high speed drive-to-work spindle permits control of light facing cuts or indicating the work before threading. Quick change-over for short runs. All motors are enclosed, yet easily accessible.

Write for illustrated booklet fully describing the Coulter Model H1. Detailed information and specifications are covered completely.

The James Coulter Machine Co.
BRIDGEPORT, CONNECTICUT

that no exception can be permitted.

Good skilled men are not plentiful today and time spent on making them feel they are appreciated is time well spent, but some knowledge of the man's mental make-up is essential for success. The good executive will know his men and trim his sails accordingly.

C. D. Mackinnon
Lanarkshire, Scotland

•

MERRILL CERTAINLY treaded on thin ice. He undoubtedly did stick his neck far out when he took it upon himself to make an unauthorized change in the fixture.

According to manufacturing ethics, the designer is supposed to create, and the explicit thing for the worker to do is to carry out the design. If he deviates from it he is overstepping the line and is liable to stir up a hornet's nest.

I am of the opinion that in each shop of a size to be governed by such procedure, a notice should be posted to the effect that each worker should carry out the design in every detail; no changes should be made without first securing the permission of the designing department.

The chances are that had Merrill approached Lester with his suggestion, Lester would have given him an ear.

Unfortunately, Ed was away at the time of Merrill's intrepid move, or, possibly, Ed would have jumped at the idea and would have battled it out with Lester.

The chances are that Merrill gave no thought to the ethical violation, and gloried in the warmth of surprising Ed upon his return tc the shop.

J. Homewood
Ontario, Calif.

"The pliers aren't there, Brownie! That's my Monday morning drawer!"

Need tools or machinery?

"One call gets them all!"

● It's faster and more convenient to use U.S. Steel Supply's "one call" service when you want tools and machinery for your plant maintenance or production needs. We have available a wide variety of top-quality equipment that will meet your most exacting requirements. One call to your nearest U.S. Steel Supply office will bring quick delivery of most items in our diversified stock. One call gets them all!

WRITE FOR FREE BOOK! You'll find plenty of helpful information in *Your Complete Guide to Metal Working Machinery and Industrial Tools.*

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Benders, Bar and Angle
Brakes, Hand or Power
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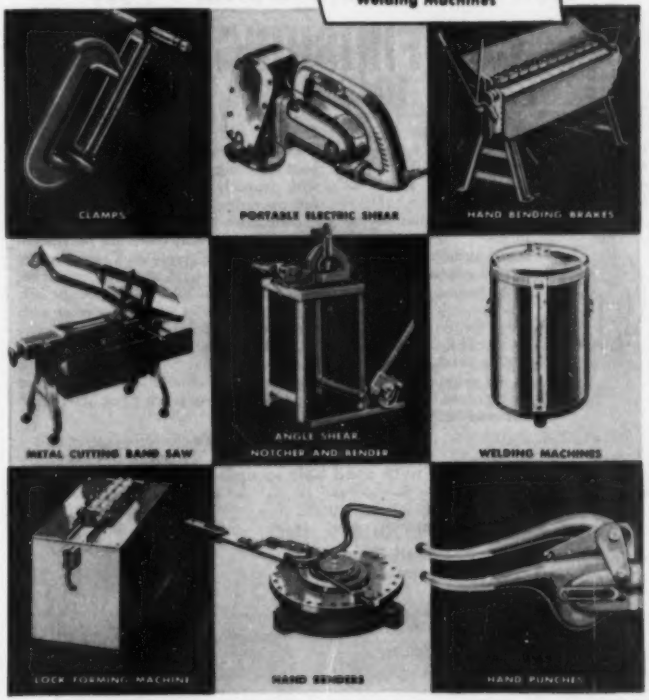
Elbow Machines
Expanded Metal
Flanging Machines
Galv-Weld
Grinders, Portable Electric
Grinding Wheels
Hoists, Hand or Electric
Lock Forming Machines
Marking Crayons
Notchers
Punches, Hand or Power
Punch Presses
Rolls, Slip, Hand or Power
Saws, Metal Cutting
Shears, All Types
Welding Electrodes
Welding Machines



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UNITED STATES STEEL COMPANY

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USS

UNITED STATES STEEL

How the "Waste Barrel" Test helps CUT FINISHING COSTS!

The primary purpose of the Jewel Brand "Waste Barrel" Test has been to help manufacturers cut finishing costs. How successful has it been? Let's take a look at the record. Three plants report as follows:

1. **A 25% production saving** in the finishing of stainless steel table knives.
2. **A 30% production saving** in the removal of welding beads on cold rolled steel boxes for tools, electronic parts and first aid kits.
3. **A 50% production saving** in the grinding and polishing of cold rolled stainless steel strip.

And these are but a fraction of the savings reported. More can and *will* be made! What about your plant, your department, your finishing operation? Is it equipped with properly selected abrasive belts for full operating capacity? Why not try the "Waste Barrel" Test and see . . . it only takes a minute and there are no obligations involved. Simply pick out a letter-size sample of used abrasive belt from your plant waste barrel (include the belt joint, if possible) and send together with completed coupon. In most cases, Jewel Brand Engineers can then recommend an abrasive belt that will wear longer, cut faster, and do a better all-around job. And *you* have nothing to lose, but high costs! Try it today!

Fill in coupon and send with used belt sample.

ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85, Mass.

We want to cut production costs! Enclosed is a sample of used belt from our plant.

NAME _____ POSITION _____

COMPANY _____

ADDRESS _____

TYPE OF PRODUCTS _____ MATERIAL _____

WE USE APPROXIMATELY _____ BELTS PER MONTH _____

BELT LENGTH _____ BELT WIDTH _____

NAMES in the NEWS

Allan Ray Putnam has been appointed assistant executive secretary of the American Society of Tool Engineers. Before joining the ASTE in 1949 as business manager of "The Tool Engineer," Mr. Putnam was associated with the American Electro-Platers Society.

James M. Wallace has been named manager of the Meter Div, Westinghouse Electric Corp. Formerly manager of the Switchgear Distribution Apparatus Dept, Mr. Wallace succeeds **G. H. Grossnickle,** appointed manager of manufacturing. **Howard A. Blair** has been appointed product manager of Self-Contained Products, Air Conditioning Div. He has been in charge of Air Conditioning Service activities of the company for the past nine years.

William L. Hartley has been transferred to Link-Belt Co's executive sales headquarters at Chicago to specialize in the application of long-haulage belt conveyors and to assist on other major engineering projects. He had been sales manager of the company's Philadephia plant since 1948. **George A. Most, Jr,** has been appointed district manager at Moline, Ill., to succeed **Stuart T. Penick,** named sales engineer at the new Colmar, Pa., plant. Mr. Most had been district sales engineer since 1944 at the Pittsburgh office.

Frank J. Staroba has been named field sales manager of the Carboloy Dept, General Electric Co. Formerly mid-western district manager, Mr. Staroba now heads the national field sales organization for Carboloy, with headquarters in Detroit. **L. L. DeCoster,** formerly sales engineer in the Indianapolis and Chicago areas, takes over Mr. Staroba's post, with headquarters in Chicago.

Edward Lee Soulé Jr, has been elected vice president and general manager of Soulé Steel Co, San Francisco. Associated with the company since 1939, Mr. Soulé was formerly manager of production control.

Harry C. Brainard has been appointed chief metallurgist of Cleveland Chain & Mfg. Co, Cleveland. He will direct the company's metal development program and will supervise quality control. Prior to joining the company, Mr. Brainard

was associated with Lyon, Inc, Detroit, and the Cyclops Steel Co, Titusville, Pa.

Richard V. D. Strong has been appointed chief engineer of F. J. Stokes Machine Co, Chicago district manager.

George W. Brown has been appointed executive engineer of Wagner Electric Corp, St. Louis, Mo. Associated with the organization since 1926, Mr. Brown had been industrial relations director prior to his new appointment in which he will be responsible for direction of the electrical and automotive engineering, and metallurgical and chemical departments.

Richard A. Gehr has been named sales manager of heaters and devices for General Electric Co's Industrial Heating Dept. Mr. Gehr, formerly N. Y. district heating specialist for the company, succeeds **Robert W. Kise,** recently appointed manager of product planning for the Industrial Heating Dept.

John A. Collinge has been elected president and general manager of G. M. Diehl Machine Works, Wabash, Ind., succeeding **Fred A. Collinge,** named chairman of the board after fourteen years' service as chief executive of the organization. The new president has been associated with the company in various capacities for the past twelve years.

July and August Are Polio Months

Wash hands carefully before eating

Don't get overtired or chilled; both lower resistance to polio

Avoid mingling with strangers, especially in crowds

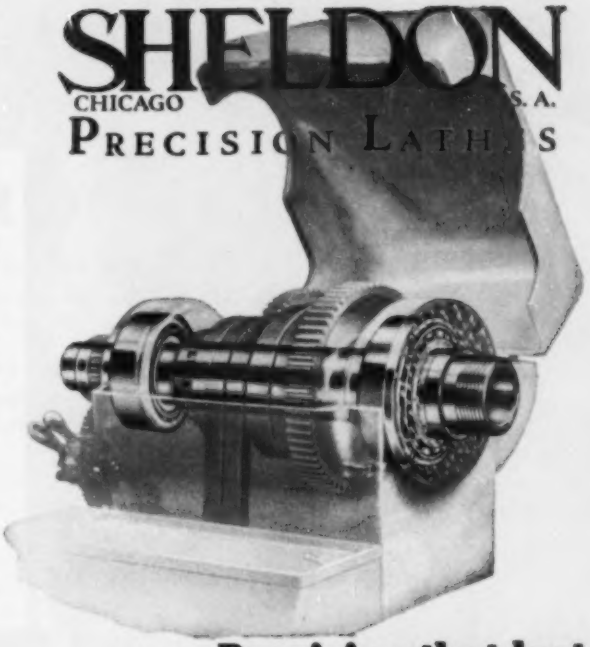
Watch for these symptoms: headache, sore throat, fever, upset stomach, stiff neck or both. If they appear, call your doctor

Polio is the only epidemic disease still on the increase in the United States; it has tripled its attack rate since 1948. You can get a copy of the 1952 "Polio Pledge" containing a fuller statement of precautions by addressing The National Foundation for Infantile Paralysis at 120 Broadway, New York 5, N. Y.

SHELDON

CHICAGO S. A.

PRECISION LATHES



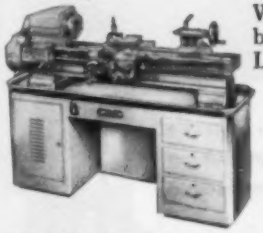
Precision that lasts

..."ZERO PRECISION" TIMKEN TAPER ROLLER BEARINGS

SHELDON

"Stamina" Features:

- Rigid, Heavily cross-strutted 1-piece Beds—2 V-ways, 2 Flat ways
- Full Double-Walled Aprons—all gear shafts supported on both ends.
- Heavy Carriage with wide bearing on bed.
- Twin V-Belts to Spindle for extra power.



No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the *exact* type and tolerances of bearings used.

The No. TS-56B (and several other) SHELDON Precision Lathes have Timken "Zero Precision" Taper Roller Bearings, held to tolerances of .00015". Not only are these the most accurate bearings used in any lathe, they are the sturdiest type . . . hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

Write for Catalog

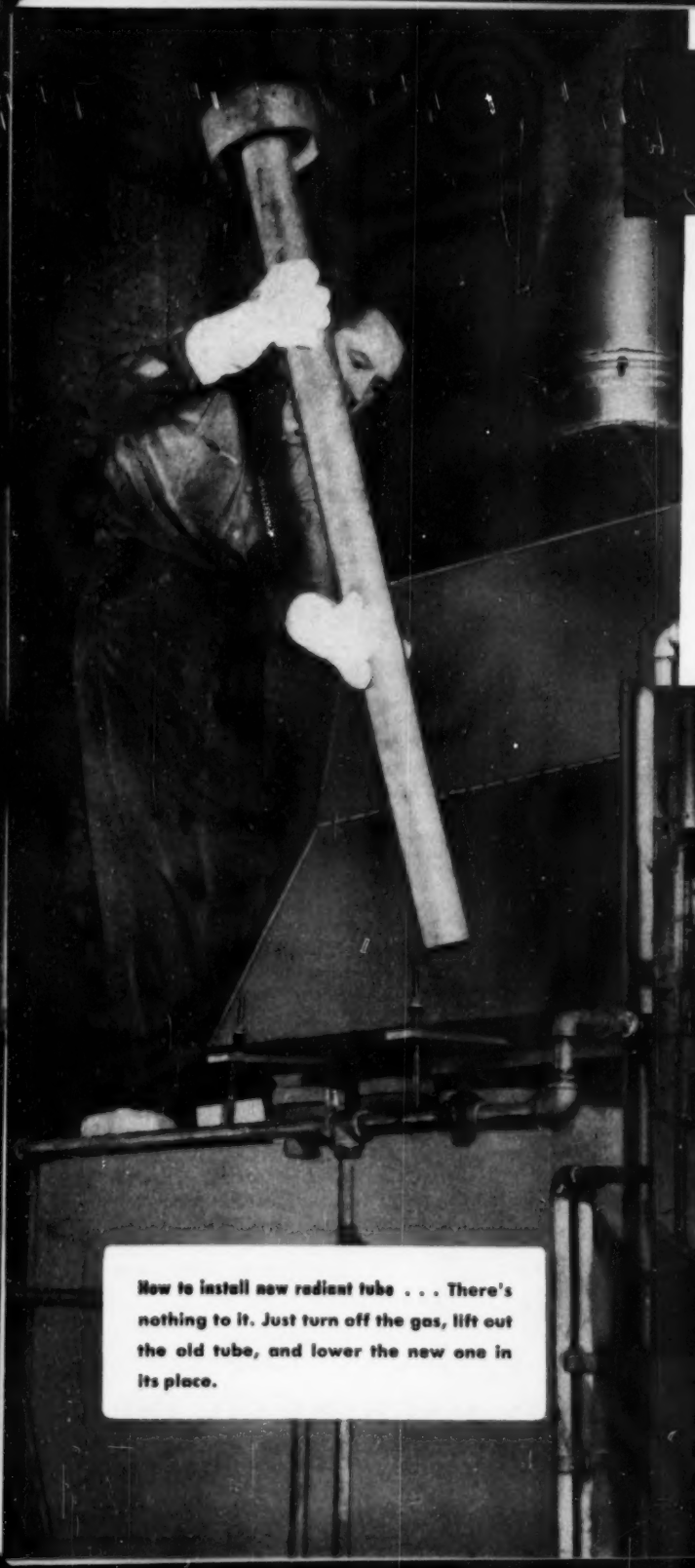
SHELDON MACHINE CO., INC.

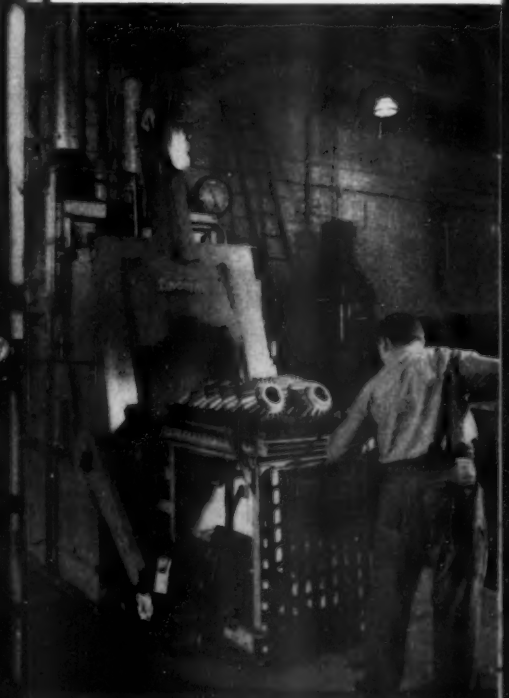
4234 North Knox Ave., Chicago 41, Illinois

zip-zip . . .
. . . like
in *LINDBERG*

Well, maybe not that fast . . . but it'll seem that fast if you've ever had to struggle around with the old type heavy radiant tubes. These new gas-fired, vertical tubes weigh only 29 pounds . . . almost as light as a razor blade by comparison.

All you do is turn off the gas, get on top the furnace, lift out the old tube, lower a new one in its place . . . and that's it.





How to install new radiant tube . . . There's nothing to it. Just turn off the gas, lift out the old tube, and lower the new one in its place.

. change radiant tubes blades in your razor!

CARBONITRIDING FURNACES

Simple, isn't it? No furnace cooling necessary . . . no extended down time . . . no clumsy plugs to unbolt . . . no squirming around inside the furnace.

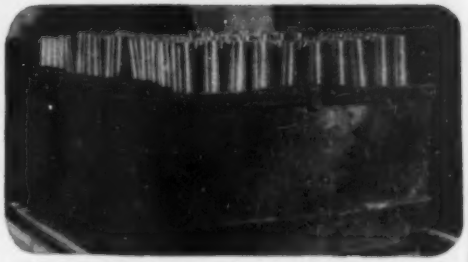
But ease of maintenance is only one of the advantages offered by this amazing Lindberg Carbonitriding Furnace. Check these important construction features:

Quench tank pit unnecessary . . . Your Lindberg Carbonitriding Furnace includes a built-in pitless quench tank . . . thus you avoid costly excavation and piping. But more important, this built-in quench tank minimizes distortion . . . quenching takes place within the furnace structure, by means of a vertically operated elevator. Heated charges are never exposed to the air . . . as would be the case if work had to be transferred from the heating chamber to a separate quench tank. Uniform case depth is assured because each charge automatically remains at heat the same length of time.

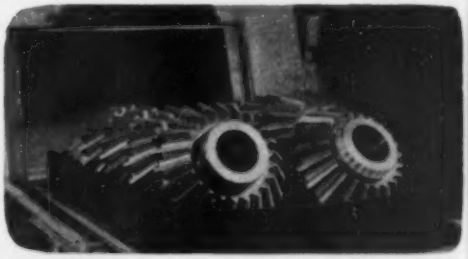
Preheat and purge chamber . . . Prior to entering the furnace heating chamber, work enters area immediately above built-in quench tank. Here, work is preheated . . . this reduces drastic temperature change when work enters heating chamber. Also, the work is completely purged while it is preheating.

Many furnaces in one . . . Furnace atmosphere is provided by Lindberg "Hyen" endothermic atmosphere generator that is easily adjustable to supply different atmospheres not only for carbonitriding, but also for carburizing, carbon restoration, bright hardening or annealing and normalizing. For annealing and normalizing the heated charge cools in the same chamber used for preheating and purging.

For additional information write your nearest Lindberg office . . . or Lindberg Engineering Company, 2445 West Hubbard Street, Chicago 12, Illinois.



CARBONITRIDING . . . Specifications called for .023 to .025" case on these low carbon seamless tubes. The charge weighed 450 lbs., and required 1¾ hours.



CARBURIZING . . . 450 lbs. of these bevelled gears, SAE 1020, required three hours total time to obtain a .032" depth.

ANNEALING . . . These SAE 1045 gear blanks were annealed to 174 Brinell. Temperature was 1550° F., time 1½ hours. The charge weighed 350 lbs. Cooling was in atmosphere.

LINDBERG **FURNACES**

Shining Example of Good Construction

good judgment calls for

PARKER-KALON®

when good design calls for

SOCKET SCREWS

DELIVERIES ARE BETTER CHECK WITH P-K FIRST

Your P-K DISTRIBUTOR *has good news. His stocks of P-K Screws are steadily improving. The size and type you need may now be readily available. Ask about it. Remember— "If it's P-K . . . it's O.K."*

Whether you make simple jigs and fixtures or giant machine tools, assembly with P-K Ground Thread Socket Set Screws will reflect superior construction throughout. Any buyer associates topmost quality with their super-smooth, gleaming *ground thread* finish.

This sales-feature is only one advantage. Assembly moves faster, too. Workers like their clean, burr-free contour, their easy keying, their dependable Class 3 Tolerance.

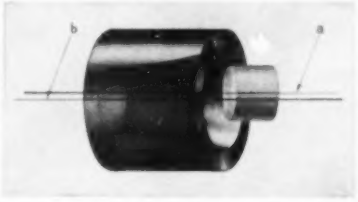
Ask for samples. See why P-K Ground Thread Socket Set Screws will put your product out in front, assembly-wise and sales-wise. Parker-Kalon Corporation, 200 Varick St., New York 14.

SIZE-MARKED CAP SCREWS • GROUND THREAD SET SCREWS • FLAT HEAD CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS

What's in Vermont this month?

To grind a taper, the internal grinder must be set up according to simple geometric principles; that is, the path of the grinding wheel must be a straight line and must intersect the axis of the workpiece at a point. In the illustration, the axis of the wheel path "a" and the axis of the work "b" lie in parallel planes. The axes cross, but fail to intersect. Under these conditions, it is impossible to grind a true taper. As the grinding wheel enters the large end of the taper, the point of contact is high. This end of the taper can be ground to size. As the wheel progresses through the hole, the contact moves even higher, with the result that the hole will be progressively oversize and a curve is generated instead of a uniform taper.

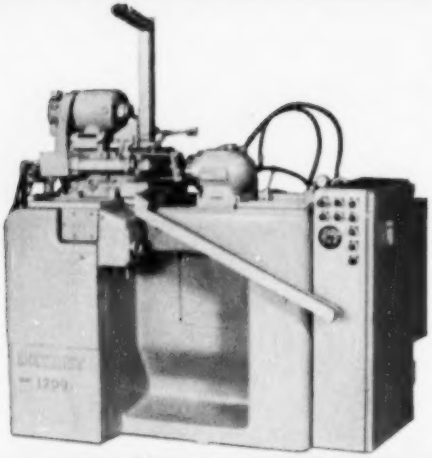
A taper ground under these conditions probably will blue only in the middle. Turning the workhead may shift this plug contact but, as the wheel wears, the plug contact will continue to move. The only possible remedy is to correct the alignment of the wheel path axis "a" and the work



axis "b" so that they intersect, then a uniform taper will be generated. In shop practice the adjustment would be made by bringing the wheel and work to exactly the same center height.

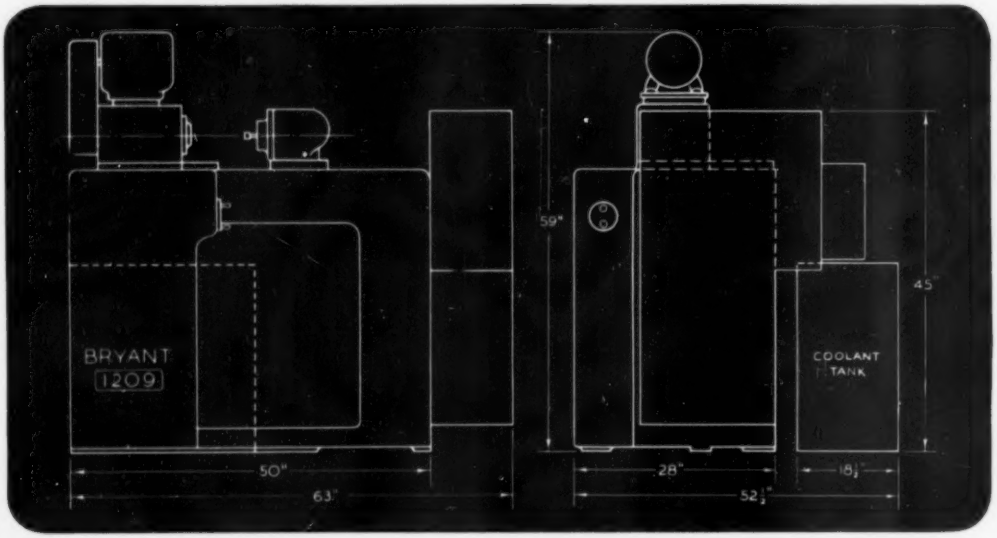
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING

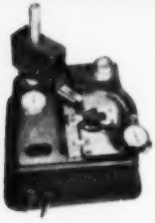


The Bryant 1209 Automatic Hole Grinder

This machine is designed particularly for high production, precision grinding of bores from ¼" to 3" in ball bearing races, gears, rolls, bushings, etc. Operator merely loads work, trips a valve to start cycle, and unloads the finished piece. The machine automatically *rough grinds, finish grinds and returns to chucking position when finish size is reached.* Hydraulic control, with individual throttles, gives infinitely variable control for each phase of the grinding cycle. The work spindle and cross feeds are driven by independent D. C. motors, giving infinite speeds and feeds with dial control. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-Frequency Wheelhead. Write for folder.



FOR CHECKING SQUARENESS OF UNDER-FACE



Bryant Thread Gage with Squareness-of-under-face Attachment

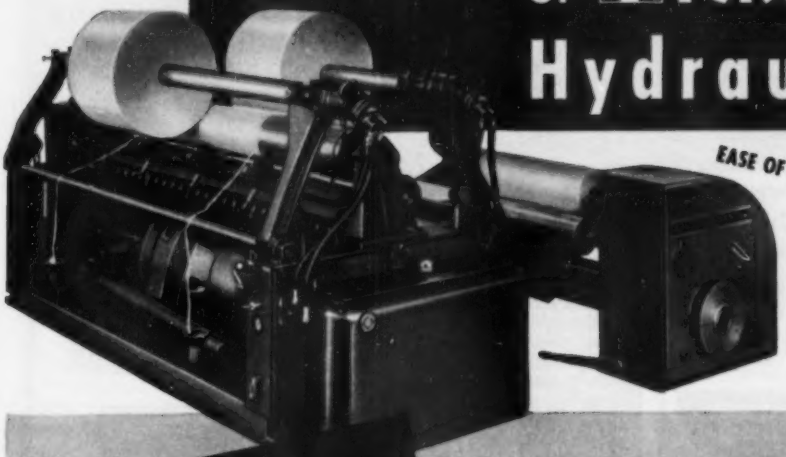
When an under-face must be checked square with an external thread, the part should be held on the thread flank and rotated in this position. The Bryant Gage does this, regardless of variation in roundness, P.D., lead or thread form. The attachment can be adjusted to check the under-face of any part which can be held in the gage. Illustrated is the No. 2 gage with a range from 1" P.D. to 2⅛" P.D. Simultaneous readings can be made — the attachment shows face run-out — the Bryant Thread Gage checks thread size — *giving accumulated reading of P.D., form and lead on dial indicator 4 to 5 times faster than plug gaging.* Send for folder.

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

VARIABLE SPEED REW

SIMPLICITY OF DE

Another COST-CUTTING APPLICATION OF VICKERS Hydraulics



EASE OF MAINTENANCE

GREATER OUTPUT

COMPACT

New

BAGLEY & SEWALL No. 15 Duplex Slitter-Rewinder

Vickers hydraulic rewind drives contribute much to the efficient surface, differential or center winding of this fast-operating machine. No power is wasted. Maximum rewind shaft driving torque is set manually for each type of winding. Varying power demand of the rolls controls the speed of the hydraulic motors to automatically adjust the delivery of the variable delivery pump to the exact system requirement. Specially adjustable Vickers Relief Valve permits slow speed starting to avoid tear.

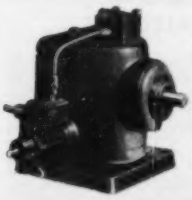
Other Vickers systems have improved performance and reduced costs for the majority of hydraulically-operated production machines built today. For details of the complete Vickers Industrial Machinery line, write for Catalog 5000 or contact your nearest factory trained Vickers application engineer.

VICKERS Incorporated • 1410 OAKMAN BLVD. • DETROIT 32, MICH.

DIVISION OF THE SPERRY CORPORATION

Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK (Metropolitan) • PHILADELPHIA PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



Vickers Variable Delivery Piston Type Pump with pressure compensated control—delivery is automatically regulated by signal pressure change at compensator. Capacities from 5 to 350 hp.

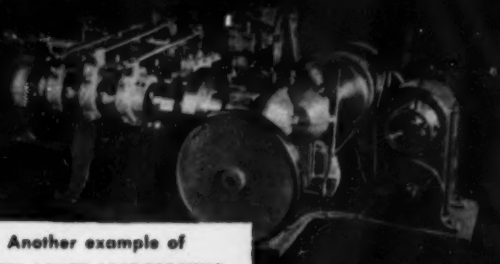
Vickers Constant Displacement Piston Type Hydraulic Motor. Torque is preselected by manual adjustment at the pump.

Vickers Balanced Piston Type Relief Valve

Vickers Proportional Oil Filter

4767

PRODUCTION RECORDS *Broken* with NILSON 4-SLIDE *Machine!*



Another example of
FASTER, LOWER COST FORMING of Ribbon Metal Stock

★ *180 Terminal Contacts* **Per Minute** ★ *7 Separate Operations* **Eliminated**

A famous national manufacturer tripled production of the Terminal Contact illustrated above (in actual size) and reduced production costs proportionately by replacing several progress die set-ups with one Nilson 5-3-F four side machine. *Seven separate operations were eliminated;* 180 completed contacts produced per minute. Time required for tooling changes was reduced 50% over similar type machines.

This example clearly shows the big savings you can make in overhead, maintenance, labor and time with a Nilson 4-slide!

Taking stock directly from the coil, NILSON metal ribbon stock four-slide machines automatically feed, straighten, pierce, blank, swage, stamp, coin, cut off and perform up to five forming operations with speed and accuracy. Built in five models with capacities up to 2½" wide and feed lengths up to 15". For specific recommendations on your wire and ribbon metal forming problems, send details, prints or samples of your operation to us when you request the bulletin.

Nilson

Specialists in Wire Forming Equipment for Over 50 Years

THE A. H. NILSON MACHINE COMPANY

1807-A RAILROAD AVENUE, BRIDGEPORT 3, CONNECTICUT

OTHER NILSON PRODUCTS:

- Automatic chain-making machines
- Automatic staple forming machines
- Wire and Strip reels
- Foot Presses
- Wire straightening equipment
- Slide Feeds for Presses

SAVE WEAR

on MACHINE TOOLS . . . CUTTING TOOLS

Extract Iron and Steel Particles from Coolants and Lubricating Oils with the **FRANTZ**

FERRO FILTER

A stack of grids is magnetized by a pair of powerful Alnico permanent magnets to remove chips and particles as fine as one micron. Cleans lubricating oil to protect all wearing surfaces . . . filters coolants and cutting oils to provide finer finishes, longer pump and tool life.

Send for BULLETIN 57

S.G. Frantz Co., Inc.
P.O. Box 1138 Trenton 6, N. J.

Manufacturers of Permanent Magnet and Electromagnetic Separators

for SMALL JIG BORING

PUT SMALL JOBS ON THIS LINLEY MACHINE

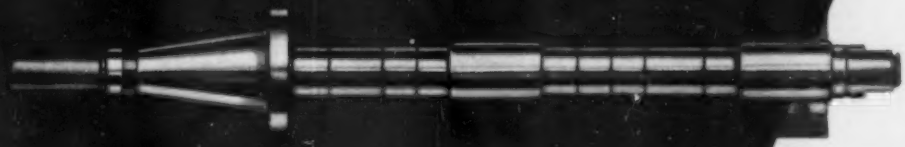
and save your larger machines for heavier work.

YOU'LL BE SURPRISED! at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6"x10" table movement and 7"x17½" table size.

Write TODAY for Full Information

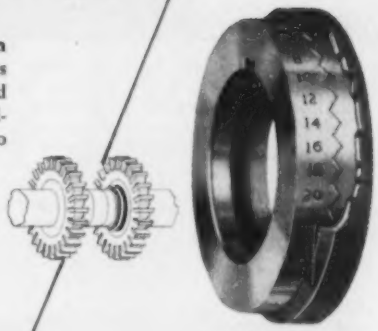
LINLEY BROTHERS COMPANY
644 STATE ST. EXT., BRIDGEPORT 1, CONN.

use S-J ARBORS and ADAPTERS



Make heavy or light cuts fast and accurate with S-J rugged precision built Arbors. Arbor and pilot diameters held to plus .0000", minus .0005". Arbors filled with spacers and sleeves which have faces ground parallel within .0002"—makes cutters run true and take an even distribution of cutting load. Taper shanks are checked on light gauges to guarantee a perfect fit in spindles and minimize run-out.

Low-cost milling machine operations are assured when using S-J Arbors. Built from forgings, they are tough and withstand the punishment required of today's production. Mass produced, they meet the test of low-cost tooling—quality at low cost that can't be beat.

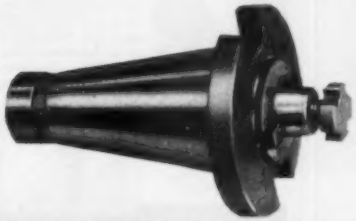


TIME-SAVING S-J ADJUSTABLE SPACING COLLARS

Save valuable time in making accurate adjustments between cutters on gang or straddle milling, and on multiple slotting set-ups.

HIGH PRECISION S-J SOLID SPACING COLLARS

Help assure true-running cutters. Carefully heat treated and faces ground parallel within .0002".



LARGE SELECTION S-J ADAPTERS

Style "C", Shell End Mill Arbor, shown here, is only one of the various S-J Adapters that enables you to convert spindles for driving a variety of tools, such as: end mills, facing mills, keyway cutters.

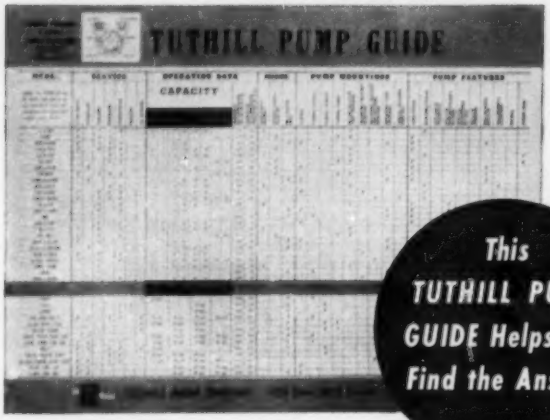
Write for New Bulletin No. 2-50 showing complete line of S-J Arbors, Collars and Adapters.

Scully-Jones AND COMPANY

1902 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

NEW EASY WAY TO SELECT THE RIGHT PUMP FOR THE JOB



This TUTHILL PUMP GUIDE Helps You Find the Answer

To save you time and trouble in selecting the pump best suited to your application, Tuthill engineers have developed this revolutionary new Pump Guide. Here, in one easy-to-use chart, is a volume-full of information on the complete line of Tuthill Pumps.

At a glance, it shows you the services for which each model is built, together with performance characteristics, types of packing, mounting styles and distinctive features that enable you to fit the pump to your need, rather than the need to the pump.

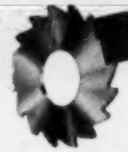
Copies of this helpful guide are now available on request. Write for yours today—there's no obligation.

Tuthill Positive Displacement Pumps Serve Industry in Lubrication, Hydraulic, Coolant, Oil Burning, Circulating and Transfer Service

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

Gott'a "SLITTING" headache?

try A GAY-LEE SURE CURE



SOLID CARBIDE "SMALLSAW"

Costs on small slitting and sawing production operations can be kept in line with Gay-Lee long wearing carbide. Diameters small as ¼".

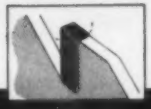
SOLID CARBIDE BRAZED HUB

A natural commutator undercutter. Brazed hub ring gives positive support, rigidity and alignment. Diameters up to 3", patented.

CARBIDE TIPPED "THINSAW"

For precision slitting and sawing. Carbide tip has strong circular seat with more braze area. Tolerances held to .0001", diameters 1½" to 5", thin as .030". Pat. app. for.

CIRCULAR TIP SEAT GIVES EXTRA STRENGTH



Carbide Saw Specialists

GAY-LEE COMPANY

CLAWSON • MICHIGAN

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

Bodine CASE HISTORY NO. 32

...AN AUTOMATIC ASSEMBLY OF STUD, SPRING AND SLEEVE

PRODUCTION: This Bodine No. 40-10 Dial Type automatic assembly machine produces 1500 completed parts per 50 minute hour at 30 strokes per minute. One operator can attend several machines. Top view shows tooling with 3 Syntron type hoppers to feed stud, spring and sleeve. Tolerance held to overall height of ±.008. Our engineers provide an overall service to solve your specific problems with Bodine automatics and tooling for drilling, milling, tapping, screw insertion and assembly.

You can't meet Tomorrow's Competition with Yesterday's Machine Tools

THE Bodine CORPORATION
BRIDGEPORT 8, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

The World's First Gage Blocks of an Entirely New Man-Made Material

DoALL
BLOCKS

With this Exclusive Combination of Advantages

1. NO THERMAL EXPANSION ERRORS!
Coefficient of expansion practically identical with steel. Interchangeable with steel gage blocks and steel parts.

2. LIGHT WEIGHT!
Less than half the weight of tungsten carbide, approximately same weight as steel blocks.

3. OUTLAST ALL OTHER GAGE BLOCKS!
Wearability many times that of steel and superior to chrome plated or tungsten carbide blocks.

4. HIGHLY RESISTANT TO OXIDATION, CORROSION!
No oxidation at temperatures up to 1000°F. Resists perspiration and acids normally encountered.

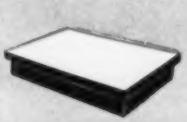
5. PERFECT STABILITY!
Will not change size nor chip even if accidentally dropped

6. PRICED LOWER THAN TUNGSTEN CARBIDE BLOCKS!

For complete information and literature, call your local DoALL Sales-Service Store or write:

THE DoALL COMPANY
254 N. Laurel Avenue • Des Plaines, Illinois

DoALL


SURFACE PLATES

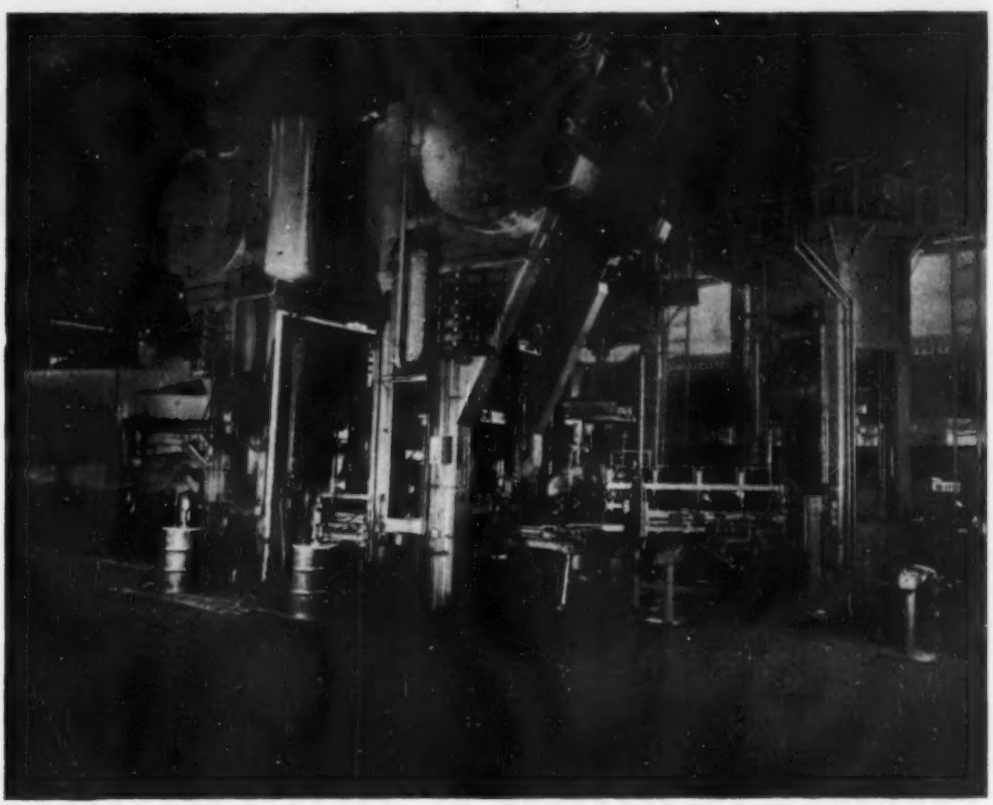
MONOLITES

MOBILE INSPECTION UNITS

OPTICAL FLATS

THIS —Verson— AUTOMATIC TOOL-UP

speeds production of large caliber projectiles



IN a tool-up developed by Verson and consisting of Verson presses and tooling, 90, 105 and 120 mm. projectiles are produced automatically from billet to finished forging. Production is increased 25% over previous methods; skilled manpower requirements are reduced substantially; material consumption is cut 15% resulting in big reductions in machining time. The tool-up incorporates conveyors for automatic handling between operations and automatic handling in the press.

This tool-up illustrates how Verson engineering can speed production and cut the cost of vitally needed defense materials. We will be pleased to send you additional information on this projectile tool-up or to discuss your needs with you. Write or phone, outlining the nature of your requirements.

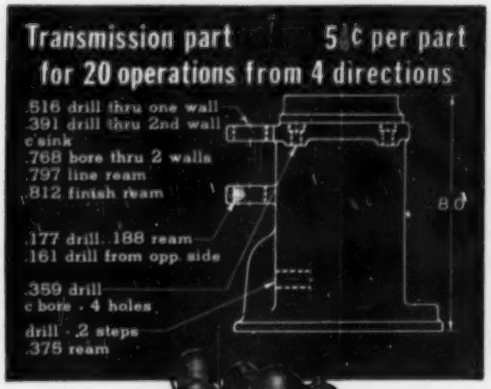
Originators and Pioneers of Allsteel Stamping Press Construction

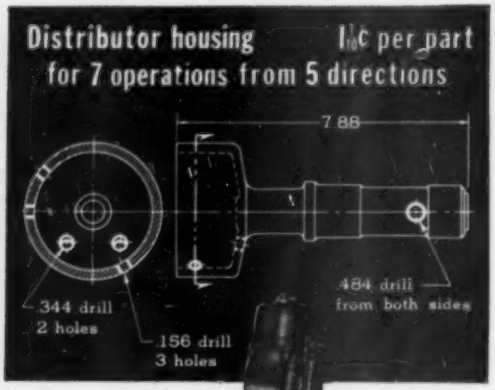
VERSON ALLSTEEL PRESS COMPANY

9316 South Kenwood Avenue, Chicago 19, Illinois — So. Lamar at Ledbetter Dr., Dallas, Texas

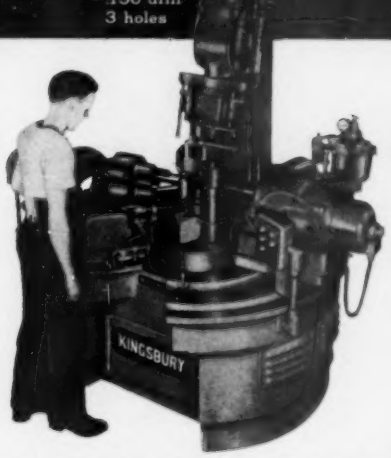
A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES





200 PARTS AN HOUR GROSS. This 40-inch Auto-Index has twelve units — three horizontal and radial for the .375 hole, three horizontal and tangent to the index table for the .188 and .161 holes, and six vertical on the central column for the others.



300 PARTS AN HOUR GROSS. This man watches the machine clamp the part, do all operations at the same time and unclamp. Then he will change parts and trip a lever to repeat that cycle. There is no indexing. Bushings in the fixture guide all tools.

How combined operations

Special-purpose high-production machines do thousands of operations per man-hour with almost no scrap loss

Dear Sir:

Combined operations cut unit costs because there is —

— almost no scrap loss,
— less handling of parts,
— less floor space.

But the big reason is this: more output per man-hour. One machine and one operator do thousands of operations per hour. The operator just changes parts in the fixtures. Each part needs just one chucking for all the operations shown.

Automatic drilling and tapping units of ½ to 5 hp each operate the tools. Each unit is compact and self-contained. Each has its own motor drive, its own speed and cam feed controls. Units may be at angles, horizontal or vertical.

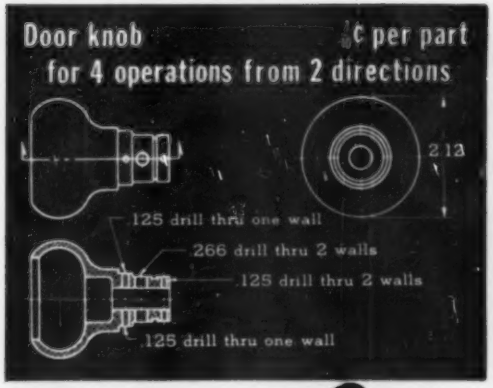
All at the same time

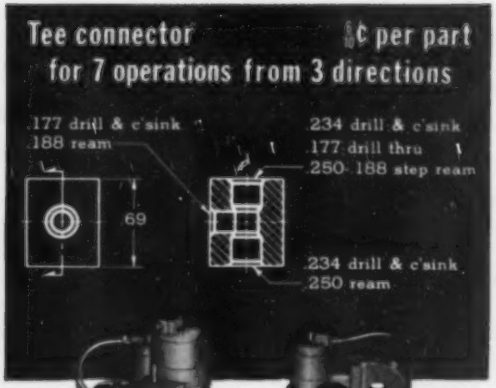
All units operate at the same time. On the Distributor Housing machine all units operate on the same part at the same time, and then the operator changes parts. The other three machines have index tables that hold a number of duplicate work fixtures. While the operator changes parts at the loading station, the units operate on the parts at the working stations. The table then indexes to present each part to the next station. Each time the table indexes, another part is finished.

Naturally we cut the time cycle to the very minimum. The longest single operation determines this cycle. Each fixture can be unloaded and loaded in that time; if necessary, clamping, unclamping and sometimes ejection can be automatic.

That, in a rather big nutshell, is how Kingsburys increase output per man-hour. It is the big saving.

Other savings: in handling with fewer chuckings of the work, in floor space with fewer machines.


Door knob
⅛¢ per part
for 4 operations from 2 directions
2.13
.125 drill thru one wall
.266 drill thru 2 walls
.125 drill thru 2 walls
.125 drill thru one wall



630 PARTS AN HOUR GROSS. This Kingsbury is fairly simple—five fixtures on a 20-inch index table and four horizontal units. Our customer specified that one hole be drilled from both ends, so one unit reaches across the machine and drills from the rear.

680 PARTS AN HOUR GROSS. A 20-inch power index table has six fixtures. Three vertical units do the .250-.188 hole and control the feed of two underneath spindles for the .250 hole, so there is no tool clash. Two horizontal units do the .188 hole.

cut drilling, tapping costs

Almost no scrap loss

Naturally, your scrap loss affects your costs. For the lowest cost, all parts should gage perfectly.

We locate spindles to exact indicator readings and use precision ball bearings. Bushings guide drills and reamers to close tolerances.

Operations are in perfect relation with one another, because each part remains undisturbed in its fixture until the operation is completed.

Each unit that operates on the part has an automatic work cycle with a cam feed that does not vary.

All work fixtures and index tables are jig-bored to minimum tool room tolerances, so there is no deviation between any fixtures or in their location on the index table.

Before we ship your machine you may check the test samples and production rate. As one of our customer's men said to his companion after gaging a few samples, "Clyde, your troubles are over."

Sincerely,
Kingsbury Machine Tool Corp.
98 Laurel St., Keene, N. H.

Each unit cost on the drawings includes the cost of the man and of the machine - no power or overhead. We assumed:

Unit cost of the man equal to:

$$\frac{\text{average U.S. hourly wage}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

Unit cost of the machine to be:

$$\frac{\text{price of machine and tooling}}{\text{output in 6000 hrs. @ 80\% eff.}}$$

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

production begins with

Columbus Die-Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

M&M
GIANT KEYSEATERS

M & M Giant Keyseaters, built in a wide range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems today.

MITTS & MERRILL 68
104 Holden Street • SAGINAW, MICHIGAN

"HAYNES STELLITE"
Trade-Mark
GUIDE ROLLS

Resist Abrasion . . .
Thermal and Mechanical Shock

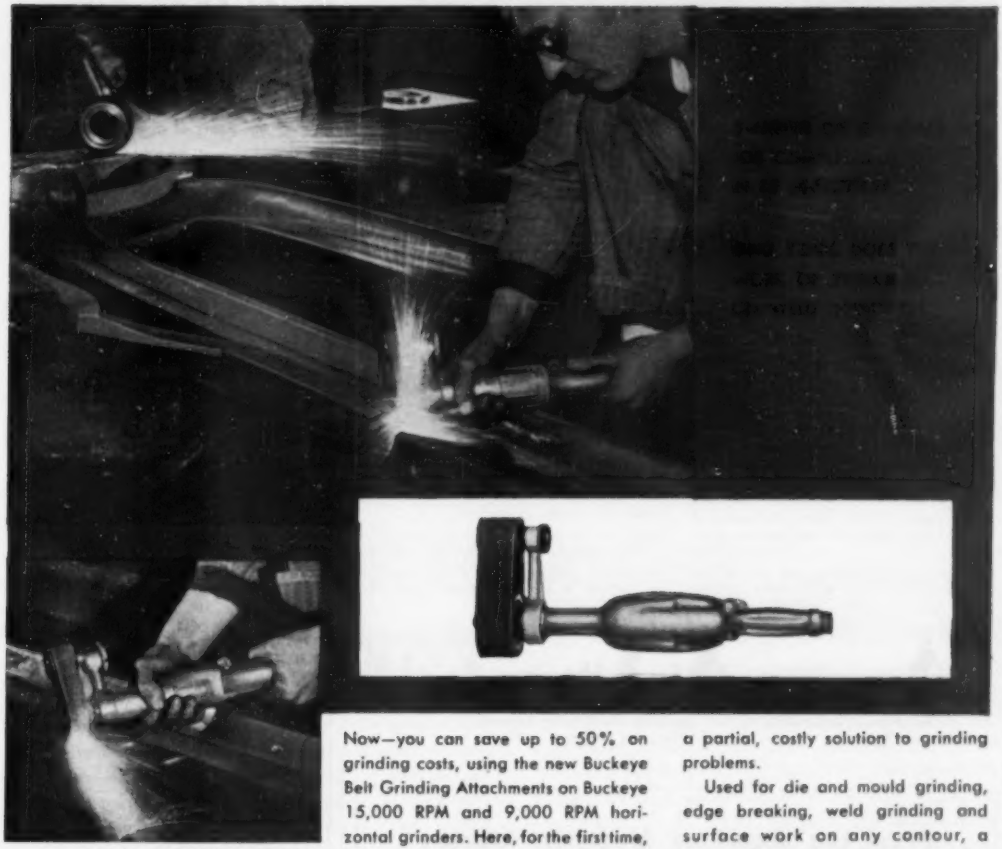
Because HAYNES STELLITE guide rolls have no temper to lose when handling hot steel, they have excellent strength and wear resistance in service. The guides also have good resistance to thermal and mechanical shock.

Loose particles of steel will not adhere to guides made of HAYNES STELLITE alloy. They are extremely resistant to oxidation at high temperatures, have a low frictional coefficient, and will take and keep a high polish.

For further information about HAYNES STELLITE alloy guides for handling bars, rods, and wire, write to our General Offices in Kokomo, Indiana.

Haynes Stellite Company
A Division of Union Carbide and Carbon Corporation
UCC
General Office and Works: Kokomo, Indiana
"Haynes Stellite" is a trade-mark of Union Carbide and Carbon Corporation.

NOW! NEW! BUCKEYE
BELT GRINDING ATTACHMENT



A Buckeye CALKER Horizontal Grinder, 15,000 RPM, equipped with BGA-21 Belt Grinding Attachment.

A Buckeye DARKAD Horizontal Grinder, 9,000 RPM, equipped with BGA-42 Belt Grinding Attachment.

Now—you can save up to 50% on grinding costs, using the new Buckeye Belt Grinding Attachments on Buckeye 15,000 RPM and 9,000 RPM horizontal grinders. Here, for the first time, Buckeye has successfully combined the maneuverability of the portable grinder with the utility of the abrasive belt. These compact new units will pare production time and costs on many applications where mounted wheels, abrasive discs, snagging wheels, cones and hand files have provided only a partial, costly solution to grinding problems.

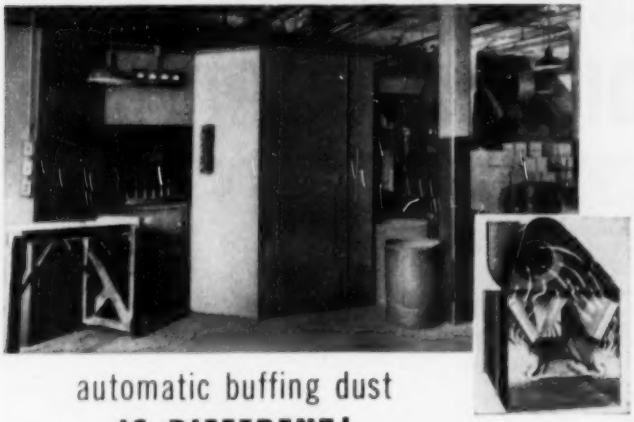
Used for die and mould grinding, edge breaking, weld grinding and surface work on any contour, a Buckeye BGA will produce a good finish, free from lap, gouge or chatter marks. Attachments, designed for use with Buckeye horizontal grinders, are sold separately and may be adapted to other air and electric grinders of the proper type and speed. Write—now—for complete information.

Buckeye Tools CORPORATION
DIVISION 15, DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario

Automatic Buffing Operation Exhausted by Type N ROTO-CLONE Arrangement B.



automatic buffing dust

IS DIFFERENT!

This Arms Manufacturer Finds Type N ROTO-CLONE Collectors The Practical Answer For Clean Air . . . Better Housekeeping.

Buffing dust has individual characteristics that create a special problem. It is composed mainly of linty particles from buffing wheels which are often impregnated with sticky compounds. Automatic buffing produces this dust in quantities and its sticky nature makes it both difficult to control or to efficiently exhaust by ordinary methods. However, a large arms manufacturer is one of many concerns which has successfully solved this problem with American Air Filter Type N ROTO-CLONES.

The Type N ROTO-CLONE is a Hydro-Static Precipitator providing collection efficiencies of more than 99%. This makes recirculation of cleaned air practical in most cases. In the Type N dust is separated from the air by means of a water curtain created by an induced flow of air through a specially designed impeller. Combined washing and scrubbing action produces high collection efficiencies on all types of dust. Arrangements are available for both manual and automatic removal of sludge.

Regardless of your clean air requirements or dust problems look to AAF for practical engineering solutions. AAF representatives are located in all major cities. Write for Bulletin No. 277.

American Air Filter
COMPANY, INC.

207 Central Avenue, Louisville 8, Ky. • American Air Filter of Canada, Ltd, Montreal, P. Q. • Pacific Division Office, San Francisco, California

From the *American Machinist* Library of *Tips for Top Shop Men*

GET to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost less to buy which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

American Machinist

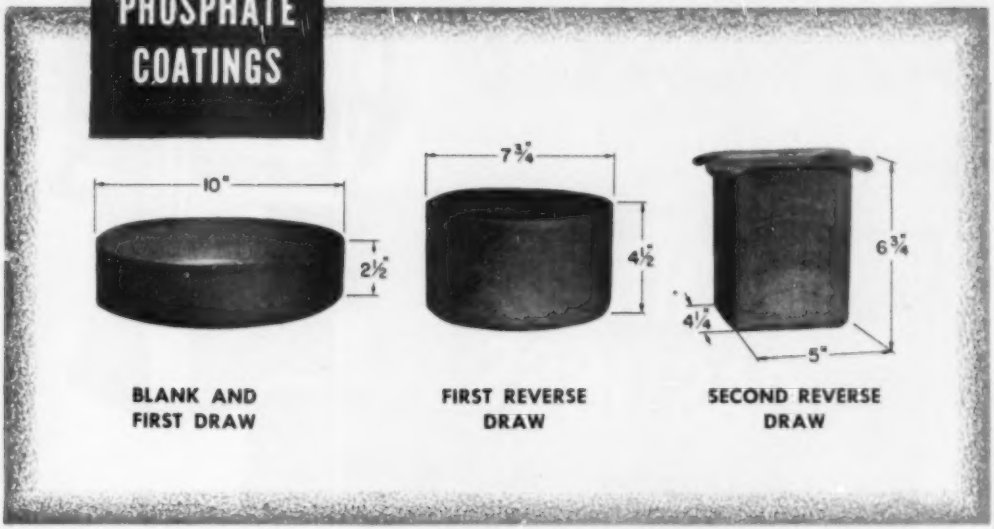
Reader Service Department

McGRAW-HILL BUILDING
NEW YORK 36

DETREX

PHOSPHATE COATINGS

Three operations— ALL with ONE LUBRICATION



EXTRUDITE PROCESS simplifies drawing operations through better lubrication!

The Extrudite Process chemically interlocks the lubricant to the work surface . . . metal-to-metal friction is prevented even during the most severe working conditions. As a result cold forming operations can be speeded up on present equipment, parts are produced with less scrap and many process anneals and chemical treatments are eliminated.

Shown above are cases for hermetically sealed electronics transformers, designed to meet rigid MIL-T-27 Specifications, and being produced by the General Electric Company. Previously, three lubrications were needed and the last one was made with pigmented drawing compound . . . hard to put on due to the contour—requiring a difficult cleaning operation to remove. With the Extrudite Process, only *one* lubrication is used, which is applied on the flat stock. Further, the metal cleaning operation after drawing is greatly simplified. As an added benefit, the drawn parts are protected by Extrudite against rust if stored before the next operation.

If you are now performing cold forming operations—such as drawing of sheet, tube or wire; room temperature extrusions; cold heading—investigate the Extrudite Process. **Detrex Corporation, Box 501, Detroit 32, Michigan.** x-3

Details of the Extrudite Process and its advantages are contained in this informative bulletin. Send for yours today, there is no obligation.

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DEGREASERS • DEGREASING SOLVENTS • WASHERS
ALKALI & EMULSION CLEANERS • DRYCLEANING EQUIPMENT
PHOSPHATE COATING PROCESSES

BLISS PRESSES

Famous for Sturdy Productivity

are built with

MEEHANITE® CASTINGS

BECAUSE the production and management team of the E. W. Bliss Company, Canton, Ohio learned from experience that Meehanite castings could regularly provide the reliable range of top quality properties demanded by their specifications, they operate two foundries which produce these castings for all major component parts.

The Bliss S-2 Heavy Duty Press shown is built with the following 10 major castings:

1. *Press Bed*
2. *Crown*
3. *Connections*
4. *Uprights*
5. *Slide*
6. *Bolster Plate*
7. *Bearing Caps*
8. *Flywheel*
9. *Gibs*
10. *Gears*

As can be seen from this list, the Bliss line, noted for its rugged dependability, precision manufacture, and trouble-free service makes maximum use of the uniform dependability of Meehanite castings—castings processed to provide the right combination of properties for the job.

Today as in the past, in modern designs the "TREND IS TOWARD MEEHANITE CASTINGS." Investigate the many ways they can improve your product—production—quality.

Write for our new sound slide film "Meehanite Castings Serve All Industry."

Take *YOUR* Casting Problem To
A MEEHANITE FOUNDRY

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Canton, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
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Pehlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
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Smith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

MEEHANITE®

NEW ROCHELLE, NEW YORK

TYPICAL COMMENTS HEARD AT ASTE SHOW ABOUT WALES DRILLING MACHINES

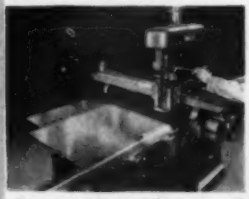
"This Machine would handle 90% of my jig boring requirements."

"I didn't know what a precision machine this was until I just watched it operate."

"Simplicity and precision make this different than any other machine I've seen."

"Designed for just my requirements."

Showing the 2 built-in "Scan-A-Scales" that accurately locate drill head and slide rail for "zeroing in". Air locking clamps hold the work rigid during drilling operations.



Showing a hole in the work being reamed by simply interchanging the drill and bushing with corresponding size reamer and reamer bushing.

● It's not what we say but what users and prospects comment about WALES DRILLING MACHINES that really tell the story.

Wales Drilling Machines are specially designed, precision engineered and accurately constructed to meet the close tolerance requirements of locating, drilling and reaming holes in material of practically any length and up to 36" wide. *There is no other drilling machine or jig borer like it.*

Built-in "Scan-A-Scales" calibrated in ten thousandths of an inch accurately locate drill head and slide rail taking over after rough positioning by rapid traverse.

For the complete story on Wales Drilling Machine, write TODAY for fully-illustrated, functionally-colored Catalog DM.

WALES-STRIPPIT CORPORATION
GEORGE F. WALES, *Chairman*
373 PAYNE AVE., NORTH TONAWANDA, N. Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO
Specialists in Punching and Notching Equipment

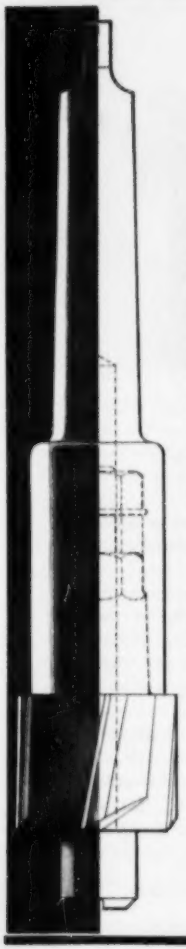
BUZZER [illegible] **FURNACES**

NO BLOWER OR POWER NEEDED . . . *just connect to gas supply*

Here's speed, economy and lifetime service in this most efficient and economical soldering and general purpose bench furnace. This #22 furnace heats a pair of 12 lb. soldering coppers in 8 minutes. Can be used for melting lead, heating small tools, etc. Since 1911 BUZZER Soldering Furnaces have been the equipment of thousands of industrial plants, shops and schools.

Write today for catalog showing various types of furnaces, burners and other equipment.

CHARLES A. HONES, INC.
121 South Grand Avenue, Baldwin, L. I., N. Y.



GAIRING

COUNTERBORES

Interchangeable Holders, Cutters and Pilots . . . quality-built tools for trouble-free Counterboring, Countersinking, Spotfacing

They Are Available from Stock in the three types shown below . . . High-speed cutters in sizes ¼" to 3" diameter with five flutes . . . and up to 1¼" in three-flute form; quick delivery of larger sizes up to 5" diameter. Holders are stocked with Morse taper and straight shanks.

Counterbore Sets contain assortments of the most active sizes of holders, cutters and pilots, each set in a hardwood box, to meet a wide variety of needs.

Heavy-Duty Type C has tapered cutter shank for perfect alignment, hexagon head for drive. Type C Holders not only take high-speed counterbores and countersinks, but also a line of *tungsten-carbide tipped* 3-flute counterbores, stocked ⅜" to 2½" diameter.

Special Cutters of all kinds are successfully operated in Type C Standard Holders . . . both high-speed and tungsten-carbide tipped . . . one-piece and replaceable-blade . . . designed for multi-diameter boring, chamfering, facing and forming.

The GAIRING TOOL COMPANY
BOX 478, DETROIT 32, MICHIGAN

for Economy **for Quick Change** **for Heavy Duty**

GAIRING TOOLS

Write for the Gairing Standard Tool Catalog and Price List, *showing Interchangeable Counterbores, Countersinks and Holders, Back Spotfacers, Core Drills, Block-Type Boring Tools, and the "E-Con-O-Mill" Standard Face Mills . . . or ask your local Gairing Representative.*

Over-age Machines Cost You Money!

Over 42 per cent of metalworking production equipment was over 10 years of age in 1949 . . . 19 per cent was bought more than 20 years ago. These machines have had an average of a quarter century of use, including five years of wartime overwork and mistreatment.

How does *your* production machinery and equipment compare with your competitors', and with the Metalworking Industry's in general? The answers will be found in the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment.

Here are all the facts on the age and number of 155 major types of production equipment operating in 15 metalworking divisions and 25 major production areas. Cost is $2.00 per copy.

Write Reader Service Department:

American Machinist
McGraw-Hill Building
New York 36, N. Y.

when the HEAT is on. . . .

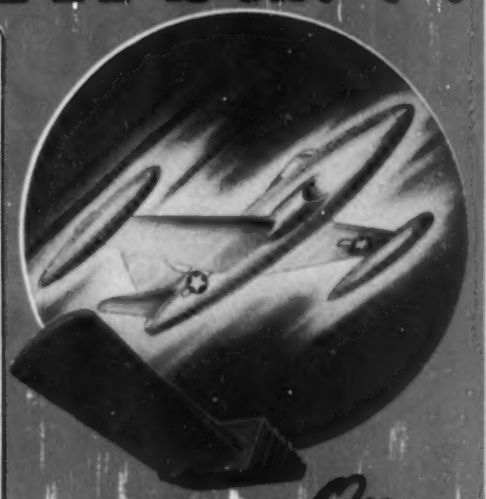
TAKE IT *Off* with KENNAMETAL

When the metal-cutting job is rugged — specifications precise — delivery schedule tight — use Kennametal tooling to "take off the heat".

Kennametal tools are remarkably hard, strong, and tough. They stay on the job longer . . . require fewer trips to the grinding room. Idle machine time is minimized . . . skilled operators work to best advantage . . . tooling costs drop — and productivity rises through higher speed and heavier feeds.

Kennametal gives this superior performance — consistently — because its physical structure is sound and uniform — a characteristic which is imparted and maintained by distinctive processes under the direction of men who know carbides from "the ground floor, on up".*

Men — with technical "know-how" — make Kennametal an outstanding tool material. And — the skilled men who operate and are in charge of metal-cutting machines fully realize its plus-value when "the heat is on".



POUR IT *On* with KENTANIUM

When there is urgent need for a material having longer service life and improved performance under high temperatures — Kentanium offers outstanding advantages.

It has much better stress rupture characteristics than conventional alloys even at 1600°F, a superiority that becomes more pronounced as temperatures increase. From 1800°F to 2200°F, for long periods, and up to 4500°F for short exposures, it withstands oxidation while retaining unusually high strength, and shows no weakening under thermal shock.

Much lighter than steels and conventional alloys, it presents design and operating advantages, particularly for rotating, or reciprocating parts.

Kentanium is suitable for: gas turbine components, valves and seats for gas engines, hot spinning tools, hot extrusion dies, and many other applications. If your design problem involves high temperature conditions, let us demonstrate how you can safely "pour on" more heat when structural elements are made of Kentanium.*

KENNAMETAL

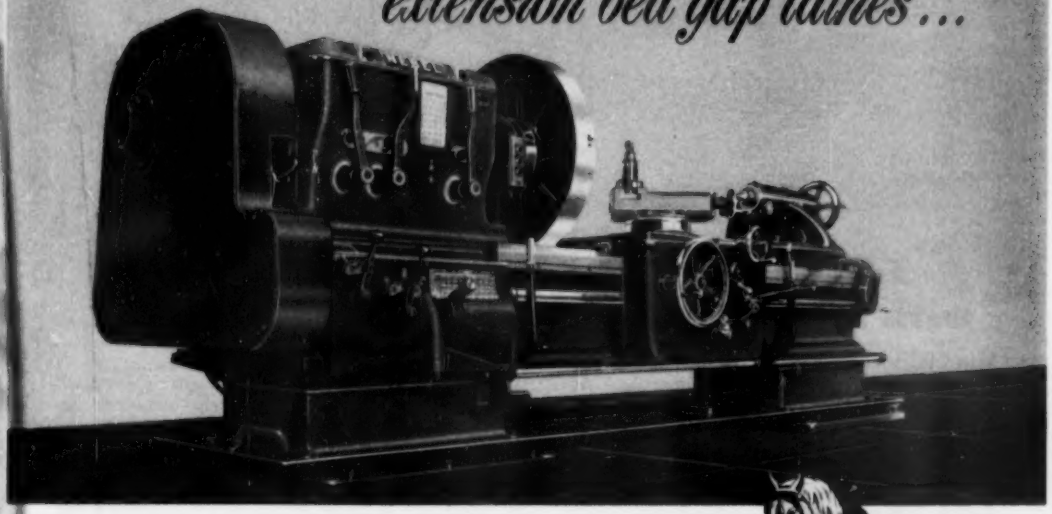
**Kennametal Inc. mines basic raw materials, refines all its carbides directly from ores, oxides, and by-products, processes these carbides into Kennametal compositions . . . then engineers and fabricates complete tools and wear-part designs that fully utilize the distinctive properties of Kennametal.*

KENTANIUM

**Kentanium—developed and produced exclusively by Kennametal Inc.—is chiefly titanium carbide with nickel as auxiliary metal (no tungsten or cobalt). Made in several different compositions to meet varying conditions. Available as standard extruded shapes . . simple molded forms . . intricate designs.*

Nebel

engine, removable block gap extension bed gap lathes...



"the **Workhorse** of the jet engine shop"

FIVE OF THE COUNTRY'S LEADING jet engine producers are using Nebel lathes proudly and profitably. One Detroit jet manufacturer remarked, "we are very pleased with the lathes and are amazed that you can sell at the price you do!"

AND THAT'S REPRESENTATIVE OF the warm reception given Nebel lathes everywhere. They're basic, dependable, heavy duty lathes, built to do *big* work at *little* cost. A Nebel's a natural . . . truly the workhorse of the shop.

BUILT IN THREE MODELS: engine, removable block gap and extension bed gap . . . in swing sizes from 18" to 50". There's a size and type for your requirements, too.

Why not send for complete information today?

★ **THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.**

Builders of fine lathes at modest cost since 1899.

28"/50" NEBEL 'G' SERIES *extension bed gap lathe machining compressor rear frame for a jet engine.*

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SPECIAL STEELS
for special purposes
check ... with

• carbon electric steel for tank clutch discs • alloy steels • armor plate • clutch plate steels • tillage steels • soft center steel • shovel steels • knife steels • saw steels, including high speed hack saw blade steels • Tem-Cross steel • heat-resisting steels • stainless steels • IngAclad stainless-clad steel

ENGINEERING
B-W
PRODUCTION

Ingersoll STEEL DIVISION

Johnson's Wax announces a

NEW WAX-TYPE CUTTING OIL

Proved: Longer tool life, better performance on machines using cutting oils

Johnson's *No. 120 Wax-Cut* is a new *wax* cutting fluid specifically designed to give maximum cutting performance and minimum tool wear on automatic screw machines, gear cutting machines and other machine tools where it is desirable to use an oil-type cutting fluid.

Johnson's No. 120 Wax-Cut was developed after months of intensive work in the Johnson's Wax laboratories and exhaustive testing and evaluation of various formulas at the University of Michigan's Department of Production Engineering. Further testing in nationally known production shops substantiated laboratory findings.

These production tests showed beyond doubt that *Wax-Cut* gives better cutting performance and a real, measurable increase in tool life over sulphurized and chlorinated oils. *Wax-Cut* also proved it had *none* of the objectionable qualities of E.P. oils!

JOHNSON'S
WAX-CUT

offers these production advantages:

▶ **Far longer tool life**

The *greater lubricity of wax* makes possible a coolness of operation that cannot be approached by E.P. oils. In production tests, *Wax-Cut* extended tool life to a degree operators previously thought impossible!

▶ **Increased feeds, speeds . . . Improved finish**

Wax-Cut's extreme reduction of heat makes increases in cutting speeds and feeds possible in many cases. *Wax-Cut's* freer cutting gives a cleaner, smoother cut.

▶ **Non-corrosive**

Wax-Cut contains no chemically active additives such as sulphur or chlorine. It can be used on all types of metals. It will not stain non-ferrous metals nor attack machine bearings, gear mechanisms or other parts.

▶ **Far cleaner . . . odorless**

This golden clear fluid has no objectionable odor, nor will it turn rancid.

▶ **Lower daily consumption**

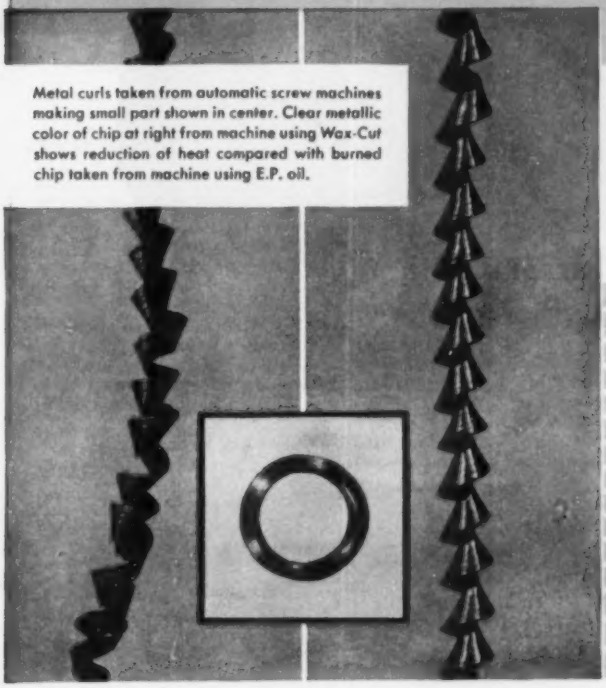
Reduced heat during operation means less smoking, burning, atomization and consumption! Wax-Cut's low viscosity minimizes the amount of "carry-off."

▶ **No mixing, no mess!**

Wax-Cut comes ready to use . . . no expensive man hours wasted in mixing additives.

▶ **Lower operating costs**

Longer tool life . . . less down time . . . uninterrupted production . . . no pre-mixing—these benefits of Wax-Cut can reduce *your* operating costs, too! A test in your shop will prove it. Mail the coupon below!



Metal curls taken from automatic screw machines making small part shown in center. Clear metallic color of chip at right from machine using Wax-Cut shows reduction of heat compared with burned chip taken from machine using E.P. oil.

A product of JOHNSON'S WAX Research

Send for complete information!

Industrial Products Dept. AM-7
S. C. Johnson & Son, Inc.
Racine, Wisconsin

Please send me all the facts about Johnson's No. 120 Wax-Cut.

Name _____

Title _____

Organization _____

Address _____

City _____ State _____

A toolroom baby that's grown into a-

Production Giant!

Rivett 918 "Steelway" Turret Lathe

Now you can produce small duplicate parts speedily in unlimited quantities with precision known only to the toolroom!

For here's a lathe that's been developed out of the bench class into a production machine. It has all the inherent precision for which Rivett has long been famous, plus time-saving features that reduce set-up and cutting operations to a fraction of that normally required. Single part production can be powered and cycled automatically.

Any one of 120 to 3750 RPM cutting speeds may be instantly and accurately selected; newly designed collets increase speed of operation as well as accuracy and gripping power; automatic chuck closer and well grouped controls step up operator time.

Bulletin 918ST will give you all the details. Write for your copy today.

RIVETT

LATHE & GRINDER, Inc.

Dept. AM87A, Brighton 35, Boston, Massachusetts

...Precision Work RELY ON RIVETT LATHES AND GRINDERS. The ... Master Tools

new metallizing handbook

CLOTHBOUND
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comprehensive 250-page volume covers all phases of this modern metal spraying process

This completely new metallizing handbook contains 250 pages of "how-to" information, including the very latest developments in the re-surfacing of worn machine parts, corrosion protective coatings, and specialized metallizing applications. Profusely illustrated with pictures, diagrams and charts, this new text is an invaluable reference for anyone concerned with metal working and the maintenance of machines, as well as with iron and steel structures and exposed equipment.

PARTIAL LIST OF CONTENTS

MACHINE ELEMENT WORK
- Surface Preparation—General
- Sprabond Wire—Surface Preparation
- METCO Method of Shaft Preparation
- Rough Thread Method
- Grit Blasting Method
- Spraying
- Inside Diameter and Flat Surfaces
- Sealing Sprayed Coatings
- Finishing

CORROSION RESISTANT COATINGS
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- Useful Data Charts

SAFETY MEASURES

INDEX

PROFUSELY ILLUSTRATED

DIAGRAMS — over three dozen clear diagrams of "how-to-do-it" information.

PHOTOS — show preparation methods, spraying operations, new equipment and accessories, new applications, etc. Includes many photo-micrographs showing characteristics of metallized coatings.

CHARTS — clearly show the effects of various gas and wire-speed adjustments, spraying distances, etc. Also, show stress, strain and shrinkage curves for sprayed coatings of various materials.

TABLES — aid in the selection of correct spraying metals, cutting tools and recommended rake angles, machine feeds and speeds, recommended grinding wheels and their characteristics, blasting methods and materials. Tables are also included in order to aid in estimating costs.

Send for your copy today

Mr. D. M. Watson
METALLIZING ENGINEERING CO., INC.
38-14 30th Street, Long Island City 1, N. Y.

Please send me_____copies of the new Metallizing Handbook.

☐ C.O.D.
☐ Enclosed is check for_____

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The following names are the property of Metallizing Engineering Co., Inc.: Sprabond Wire, Sprayweld, Metco-Weld H, Metco®. ®Reg. U.S. Pat. Off.

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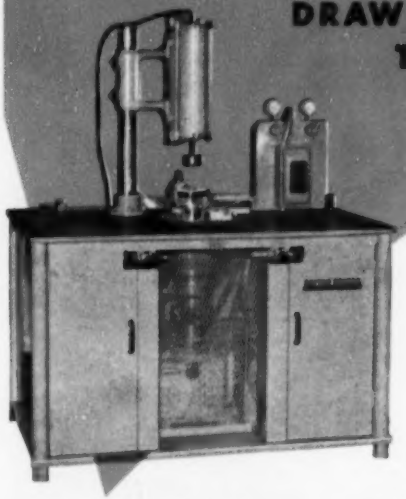
Parent British METALLIZING EQUIPMENT COMPANY LTD. Chobham near Woking England

DAYTON ROGERS
DRAWN SHELL TRIMMER



LOWER DIE COSTS— BETTER PRODUCTION ON LONG OR SHORT RUNS

The new Dayton Rogers Drawn Shell Trimmer was especially designed to trim square or rectangular shells with small corner radii. It will also bead, knurl, form serrate, stencil, offset, and bevel. All such shell finishing operations are performed quickly, accurately, and efficiently in one work cycle. It will handle drawn shells of practically any depth and of thickness up to 13 gauge. It is easily and quickly set up and tooling is relatively inexpensive.

Ask for typical costs and
Suggested tooling without obligation!

DAYTON ROGERS
Manufacturing Company

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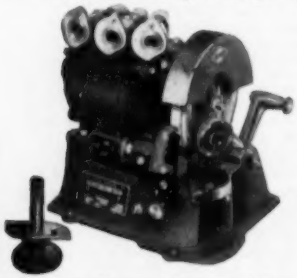
SAVE—50% & more on Grinding Small Drills. SAVE on Drilling Time. SAVE by Reducing Work Spoilage. SAVE in Every Use of Small Drills.



This motor-driven machine cuts grinding and drilling costs 50% and more, saves expensive drill stock, reduces work spoilage and drill breakage.

Keep them sharp with a

BLACK DIAMOND
PRECISION DRILL GRINDER FOR ALL SMALL DRILLS

When you need sharp, small gauge or fractional drills in quantities—it costs real money to put an experienced mechanic to work on them.

With a Black Diamond, however, even the most inexperienced laborer can keep all small drills sharp, ready to meet any emergency—with lips accurately ground to exactly the same length, proper angle and with correct clearance for fast, precision drilling.

The built-in Diamond Point Dresser keeps the grinding wheel ever sharp cutting and the Web Thinning Attachment cares for all types of Notched points to perfection.

Write for More Complete Details Today

BLACK DIAMOND SAW & MACHINE WORKS, INC.
45 NORTH AVENUE, NATICK, MASSACHUSETTS

BALANCING FOR MASS PRODUCTION

"HI-EFF" BALANCING MACHINES

Fast . . . and Accurate!

● The sure way to cut vibration, get longer life and greater safety from your product, is to balance rotating parts. And Taylor HI-EFF Static Balancing Machines assure you of sensitive, accurate, high-speed production balancing.

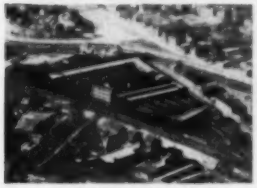
Use HI-EFF machines for balancing fans, impellers, tires, grinding wheels, brake drums, sheaves, pulleys and many other products. 300 auto fans per hour, 200 auto tires per hour, 80 grinding wheels per hour, 60 clutch assemblies per hour . . . these are typical reports from users.

HI-EFF Static Balancing Machines are now offered in nine different capacity models—and other models are available to meet special requirements. Taylor engineers will be glad to make recommendations for your specific problem. *Write for descriptive Bulletin No. 761.*

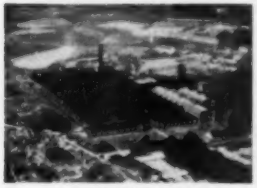
● DYNAMOMETERS ● STATIC BALANCERS
PRECISION DRILLING MACHINES

TAYLOR DYNAMOMETER AND MACHINE COMPANY
528 WEST HIGHLAND
DEPT. M, MILWAUKEE, WIS.

MARCINELLE—Plant No. 1



MARCINELLE—Plant No. 2



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HERSTAL

ACEC

electric motors

are backed by 70 Years' Designing & Engineering Experience plus 4 Modern Plants

Four up-to-the-minute plants, utilizing the accumulated engineering and manufacturing experience of seven generations to produce the finest type electrical equipment, that's ACEC—Ateliers de Constructions Electriques de Charleroi, of Belgium.

And world-famous ACEC motors are now *immediately available* to American customers from warehouse stocks in the United States.

Conforming strictly to NEMA FRAMES AND SPECIFICATIONS, these 1-phase and 3-phase motors are not only products of long experience and scientific research, but of extreme care in manufacture and close attention to mechanical precision. They are built to give every possible satisfaction in service . . . to uphold the world-wide reputation for excellence that ACEC equipment has established.

Branches and representatives of ACEC are located throughout 50 countries, and service in the United States is available from 232 DISTRIBUTORS AND SERVICE SHOPS across the nation.

Whatever your electric motor requirements, write, wire, or telephone the nearest ACEC office or representative—or communicate with us directly in New York. Inquiries and orders receive prompt attention.

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CHICAGO
KANSAS CITY
NEW ORLEANS
HOUSTON AND
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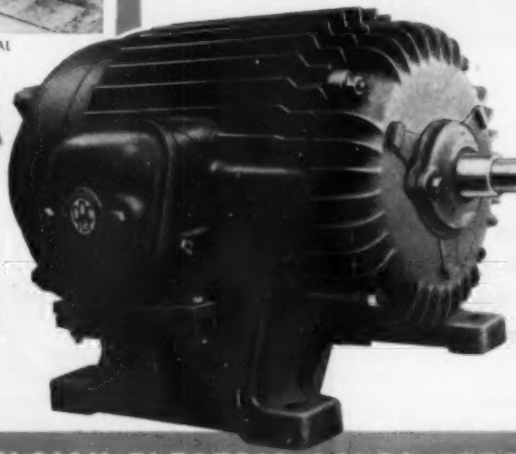

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Integral Horsepower Electric Motors—(NEMA)

FULLY GUARANTEED

Available in the following types:

- ★ *Open Drip Proof Motors*
- ★ *Totally Enclosed Fan Cooled Motors*
- ★ *Pump Motors:*
  - *Style "C" Face Mounted*
  - *Style "P" Vertical Solid Shaft*
  - *Vertical Hollow Shaft*
- ★ *Adjustable Speed Schrage Motors*

MOTORS EXCEEDING 200 HP. BUILT TO ORDER

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GEARS

To Your Specifications

Over one hundred [illegible] jor machine tools pl[illegible] our twenty-five years continuous gear production for aircraft and industrial fields are at your service.

Your Inquiry Is Invited

ACME GEAR COMPANY

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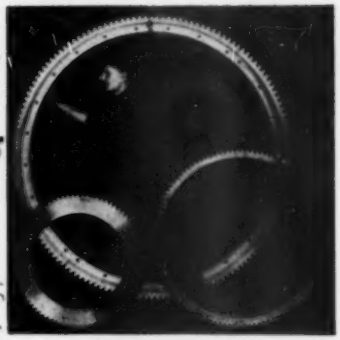
Three Finished Performers



The solid and split-ring spur gears illustrated are ready to give precise, enduring performance on Rotary-type drums. Stahl-built is precision-built, from selection of the steel to final inspection and shipment. For accurate, long-lasting gears in any quantity, produced economically and quickly, you'll be ahead by getting Stahl's estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP
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RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS; RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY

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gears

- SPUR
- SPIRAL
- BEVEL
- WORMS
- WORM GEARS
- SPROCKETS
- RACKS

In Any Size — Quantity or Material
Send For Estimate
No Obligation

BRAUN GEAR COMPANY

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JOB FITTED- *Every Time!*

Each Cincinnati Gear is cut to your exact specifications—you know in advance that it will fit its job precisely . . . run smoothly, quietly.

Spur ★ Worm ★ Internal ★ Spiral Bevel
Helical Herringbone Coniflex Bevel Spline Shaft

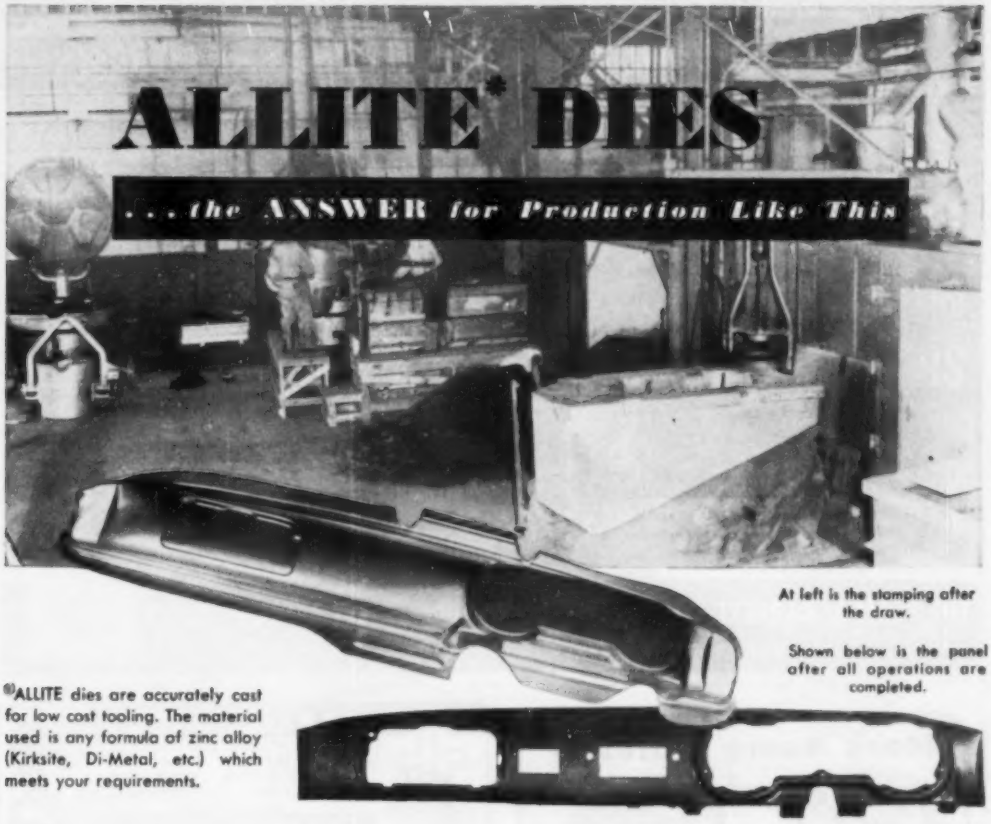
THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

ALLITE* DIES

. . . the ANSWER for Production Like This



At left is the stamping after the draw.

Shown below is the panel after all operations are completed.

*ALLITE dies are accurately cast for low cost tooling. The material used is any formula of zinc alloy (Kirksite, Di-Metal, etc.) which meets your requirements.

Allite Dies were used as the tooling for this right-hand instrument panel. These were the results:

- The tooling costs were less than half that which would have been required for iron dies.
- The customer reports that more than 8000 stampings have been produced, with the original Allite draw die still in serviceable condition. This die is 100% zinc alloy.

This is typical of many Allite Die applications where all the advantages of low cost tooling, faster production starts and accurately built tools have been combined. And that has only been made possible by the close coordination of foundry and die shop facilities which only Allied can offer.

Allite Dies can be the answer to your experimental or short run production die problems, too. Why not write today for the complete story.

Other

ALLIED PRODUCTS

HARDENED AND PRECISION GROUND PARTS • SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED PRODUCTS

ALLIED PRODUCTS CORPORATION

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Detroit, Mich.

PLANT 2
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PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

A Quick, Smooth, Uniform coating—assured by
BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With the Barrett Whizo Galvanizer, excess metal is quickly removed from small parts after dipping in molten metal, in fact, much faster and more uniform production is assured. Parts will also pass the most rigid inspection for quality.

The method of handling is simple and easy. Work to be coated is placed in a round basket and submerged in molten metal. When thoroughly heated, the basket is placed in the Barrett Centrifugal to be immediately accelerated to high speed, the excess metal being thrown off before it can cool.

A quick pick up and stop (from 2 to 3 seconds each) assures maximum production with an even thickness of coating.

Machines furnished with or without heated surrounding drum, in capacities from 40 to 240 loads per hour, handling from 5 to 100 lb. loads. When used for tinning threaded work, rethreading has been found to be unnecessary.

Barrett Centrifugals are used extensively, combine speed with convenience of operation and the utmost in safety. They are highly developed to meet all reasonable requirements, have self-contained motor drive and occupy a minimum of floor space.

•

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT COMPANY, 1800 Grafton Road **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

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1/5 the Time

Cutting costs in these times is a good trick if you can do it. You can, on plates requiring detail marking, by using an Automark Electric Metal-Marking Typewriter. The operator lightly touches the key and the Automark does the rest, quickly and automatically. No dial to turn—no lever to pull. Marking output is increased five times and worker fatigue is greatly reduced. Write today for Bulletin 8-16.

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KALLAY GEAR WORKS
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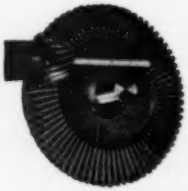
Spur—Helical
Herringbone—Sprockets
3/16 Pitch Sprockets



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BILGRAM TRADE MARK

ALL TYPES • ALL MATERIALS

BILGRAM GEAR & MACHINE WORKS
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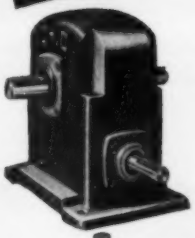
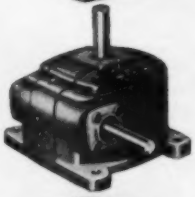
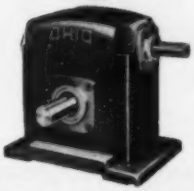
STANDARDIZE WITH OHIO STOCK GEARS AND SPEED REDUCERS

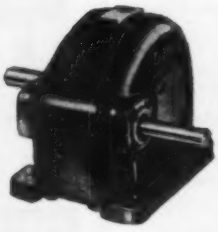
Meet today's tough production schedules "right off the shelf" with OHIO Gears and Speed Reducers. One glance through the pages of an Ohio Gear catalog and you immediately find ways to cut the cost and improve your product. Your production steps up automatically once you have adopted Ohio Gear as a "stock" source of supply.

Take advantage of Ohio Gear's years of engineering experience in every type of gear and speed reducer, the choice of thousands of engineers for the design and maintenance of power transmission equipment — Ohio Gear is prepared to meet your most difficult requirements. Call your nearest distributor or write direct.









OHIO GEARS

ESTABLISHED 1915

THE OHIO GEAR COMPANY

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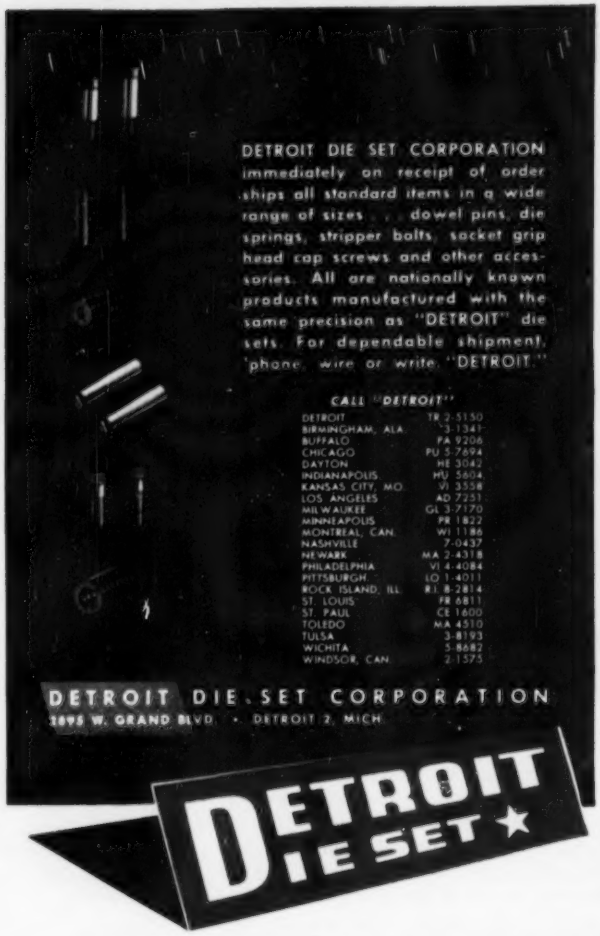
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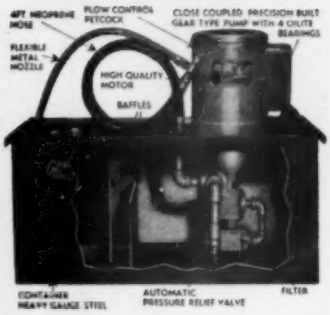
PUMPS AND COOLANT SYSTEMS



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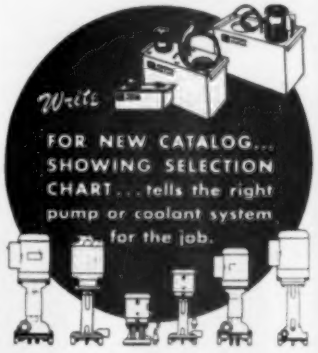
PROPER application of coolants means increased production and time and tool savings. You can have these advantages for every machine—small, large, and special—with Graymills Portable Coolant Systems.

They can be installed in a few minutes, are modern in design, and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.

Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to ½ HP ratings, 1 gal. to 70 g.p.m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.



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GRAYMILLS CORPORATION
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From the *American Machinist* Library of *Tips for Top Shop Men*

TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

WHEN you walk the tight-rope between close tolerances, or between good and bad finish, balance is vital. Be sure you have it, in machine-tool spindle or shaft, in tooling, in fixture. It will pay out in longer tool life and reduced scrap.

THREE THINGS YOU CAN EXPECT FROM

Minster Parts Service

"You can't beat Minster service,"

Says Herman Gabriel, tool and machine repair foreman, Lau Blower Co., Dayton, Ohio.

"24 out of 33 big presses in my shop are Minsters and I wish the other nine were of the same make."

When a press needs repair parts you have a right to expect three things. You *get* all three when your press is a Minster.

FIRST . . . *speed.* Minster makes an honest effort to help customers with downtime trouble. In these days we can't promise miracles but you only have to check Minster press users to find our emergency service is tops.

SECOND . . . *accuracy.* A Minster press repair part arrives ready to install. It is made as carefully as the original part.

THIRD . . . *simplified installation.* Repair of a Minster press presents no unusual difficulties. A Minster press is designed for easy access, easy replacement, easy adjustment.

Contact your nearest representative and have him show you his service records or tell you about the new Minster press designs.

THE MINSTER MACHINE CO.
Minster, Ohio

MINSTER
FIRST IN *Press* DESIGN

Gosh, I Wonder WHEN We'll Get that Special Machine?

Why wait? Perhaps the Job Can be Done on a Standard Machine with Kempsmith Attachments

You know — it's really surprising how many difficult milling operations can easily be handled by Kempsmith Standard Attachments mounted on a standard milling machine.

Manufacturers faced with urgent production schedules are utilizing Kempsmith Standard Attachments to help solve their milling problems. These precision-built accessories are made to perform the most delicate milling operations, with speed and accuracy. They frequently eliminate the need for special, single-purpose machines, at the same time reducing production costs to rock bottom.

Look to Kempsmith for milling machines, attachments, arbors and accessories. They are backed by more than 60 years specialized experience in this field.

Write for bulletins describing Kempsmith Standard Attachments, Arbors and Accessories.

KEMPSMITH MACHINE CO., 1823 S. 71st St., Milwaukee 14, Wis., U. S. A.

KEMPSMITH

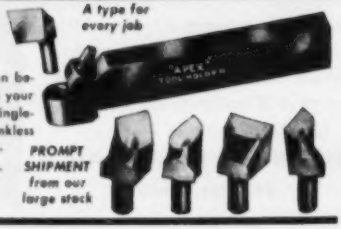
Precision Built Milling Machines Since 1888

APEX INSERTED-BLADE METAL-CUTTING TOOLS

APEX TOOL BITS FIT MOST STANDARD HOLDERS

If you haven't yet changed to Apex, you can begin to get acquainted by using Apex Bits in your present holders. The Apex line includes Single-Point Round Shank (as shown) and Shankless Serrated — plus Inserted-Blade Milling Cutters of all different styles. Write for catalog.

A type for every job



***PROMPT SHIPMENT** from our large stock*

APEX TOOL & CUTTER CO., INC.
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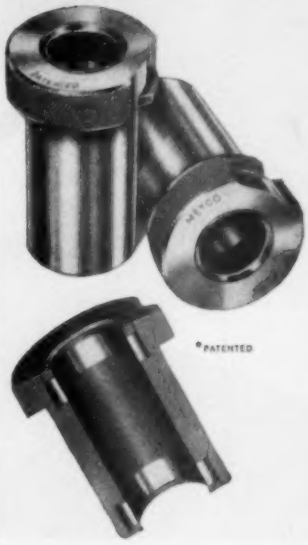
MEYCO

CARBIDE INSERTED DRILL JIG BUSHINGS



*PATENTED

☆ Combining the best features of steel and carbide—here is the answer to increased production and to tough drilling problems: MEYCO Carbide Inserted Drill Jig Bushings.

MEYCO bushings last as long as solid carbide bushings in most cases and cost a great deal less—they will increase the life of drill jigs, fixtures, drills and reamers—they will maintain accuracy for a much longer period of time—they will increase production, save you money in machine-down time, lost man-hours and less spoilage.

MEYCO bushings are made to A.S.A. Standards in Headless Press Fit, Head Press Fit and Fixed Renewable Types. MEYCO Bushings can also be adapted to many special applications—write for fully informative catalog No. 33 today.

Manufacturers of precision tools since 1888

W. F. MEYERS CO., INC.
BEDFORD, INDIANA

48,000 Spot Welds

with a single MALLORY "Nu-Wrinkle Cap"* Electrode

Outstanding Design Features of MALLORY "Nu-Wrinkle Cap" Electrodes

1. Smooth, annular corrugations of cap skirt provide positive electrical and thermal contact with shank.
2. Resilience of corrugations effects secure attachment of cap to shank.
3. Wiping action of corrugations cleans adjoining surfaces of shank, assures low electrical contact resistance.
4. Hollow cap skirt has the largest practicable cooling area, results in a maximum rate of heat transfer.
5. Smoothly rounded skirt corrugations minimize damage to shank, insure maximum shank life.
6. Unique design eliminates possibility of cap being forced askew into shank.

A well-known manufacturer of farm equipment put Mallory "Nu-Wrinkle" replaceable cap electrodes to work on his production line . . . got more than 48,000 welds with a single cap. Here are the facts:

Material . . . . . 1025 Steel—Pickled
Gauge . . 18 and 20 gauge (0.050"-0.037" thick)
Welding Speed, About 147 spots per minute
Machine 75KVA
Weld Time . . . . . .8 cycles

AND DRESSING TIME WAS CUT TWO-THIRDS by the use of the Mallory "Nu-Wrinkle Caps". Thus the manufacturer was able to save both time and money . . . got more welds per dollar.

• • •

Used 75 "Nu-Wrinkle Caps" on a Single Shank . . .

Additional proof of the economy offered by Mallory "Nu-Wrinkle Caps" is shown by the experience of a West Coast manufacturer who used 75 caps on a single shank. This is exceptional but other users average between 20 and 25 caps per shank . . . save real money.

• • •

It will pay you to team up Mallory "Nu-Wrinkle Caps", shanks and electrode holders . . . to count on Mallory for all your resistance welding needs—electrodes . . . holders . . . dies . . . castings . . . forgings . . . rod and bar stock . . . Elkonite®. Get details today from your distributor . . . or call or write direct to Mallory.

*Trade Mark, Patent Pending

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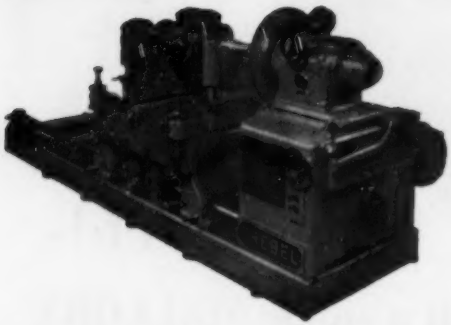
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

IMMEDIATE PRODUCTION SHORT CUT



New Dynamic Balancing Principle checks unbalance of rotating parts in Less than a Minute

No special skills are required to operate the NEW TREBEL DYNAMIC Balancing Machine. Just place the work in the machine, push the starter button, make two handwheel settings and get direct, accurate readings of the amount and location of unbalance—all in less than 60 seconds. That's why one TREBEL machine now balances as many 60-100 H. P. rotors in *one hour* as formerly required an entire shift with other methods.

Unique Balancing Principle using a counter force to compensate for unbalance eliminates complicated set-ups and makes possible the indication in simple, easy-to-read units such as length of wedges in inches, or depth of a standard diameter hole, etc.

Lower initial and operating cost—and little maintenance—makes the TREBEL worth your investigating *now*. Delivery is prompt, too. May we send you full details?

See this machine in operation in New York, Detroit or our Cleveland Service Center

KO

KURT ORBAN CO., INC.

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4220 Prospect Ave., Cleveland • 19450 James Couzens Highway, Detroit 35
Canadian sales by European Machinery Ltd., 11 King St. W., Toronto, Can.

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

SAVE VALUABLE ALUMINUM!

Cutbacks of aluminum for civilian consumption, and its importance in defense production, increase the necessity of economical and efficient methods for working this widely used non-ferrous metal. The *American Machinist* Special Report, "How to Work Aluminum and its Alloys," explains what you can do to make your supply of aluminum go further.

This valuable 16-page article is a summary of the latest developments in fabricating this vital metal . . . the characteristics of aluminum alloys . . . machining methods . . . sheet-working methods . . . casting and forging . . . joining methods . . . cleaning and finishing. Reprints of this timely article are available at only 25 cents per copy.

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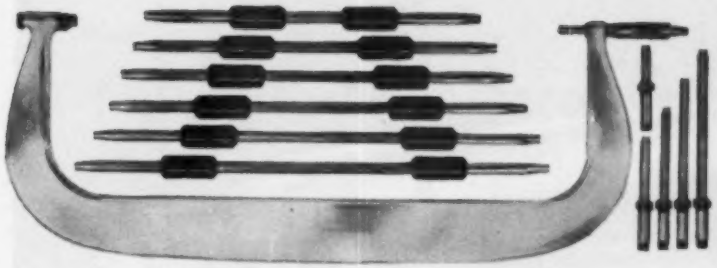
The TUMICO Bar Micrometer



SHALLOW, TUBULAR FRAME FOR PRECISION LONG-SPAN MEASUREMENT!

The shallow frame of the Tumico Bar Micrometer slips in where frame clearance is too small for ordinary micrometers. The hollow steel frame cuts weight in half . . . makes precision measurements easy, even in the largest sizes. It is made in over 30 models ranging from 6″ to 168″. The Tumico Bar Micrometer can be furnished with either adjustable mandrels or sliding bar anvil.

All Tumico micrometers, gages and measuring instruments are fully and easily adjustable for wear. Skilled engineering has reduced weights up to 50%. "Feather touch" feel and balance speeds measurements and assures accuracy.

Tumico instruments control production for many of America's largest manufacturers. Consult us for special production gages, calipers, alignment instruments, etc. Catalog sent free on request.

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA

FEATHER TOUCH

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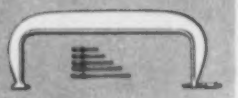
FOR EVERY JOB
TUMICO
PRECISION MEASURING INSTRUMENTS

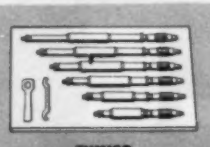


TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6″ to 168″.

TUMICO DIAL INDICATOR GAGES
Quick vision Tumico micrometers and gages to meet your special measurement requirements.

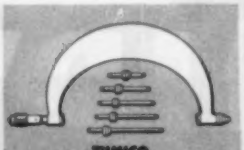
TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0″ to 30″ in 1″ steps.

TUMICO VERNIER CALIPERS
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6″ to 48″.



TUMICO INSIDE MICROMETERS
Tubular construction; insulated from hand heat for full precision. 37 models from 1″ to 104″.

TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



TUMICO OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3″ to 28″.

TUMICO COMBINATION SETS
Square, Gage, Center Finder, Protractor, Scriber, Level, Rule, Straight Edge. Handy and useful.

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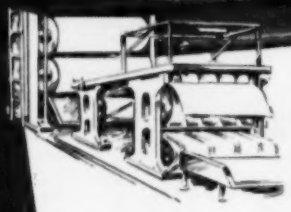

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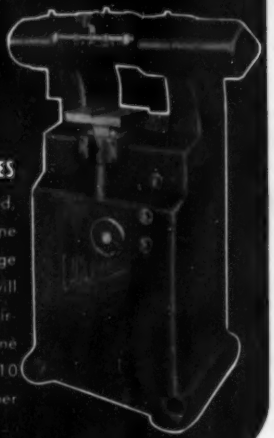

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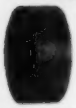

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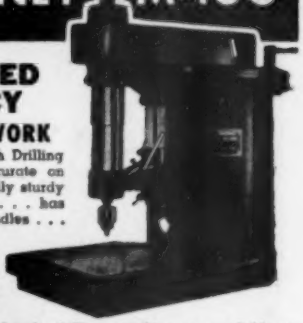

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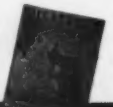

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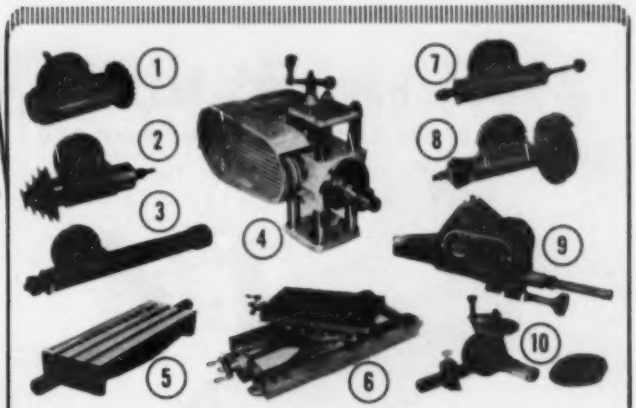

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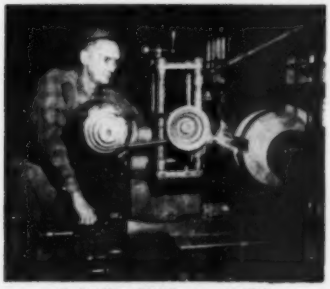

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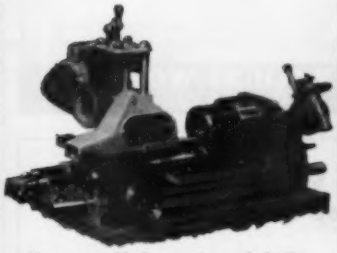

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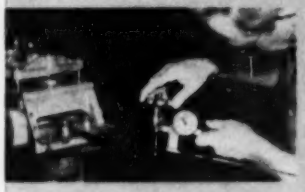

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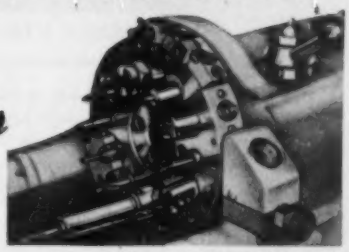
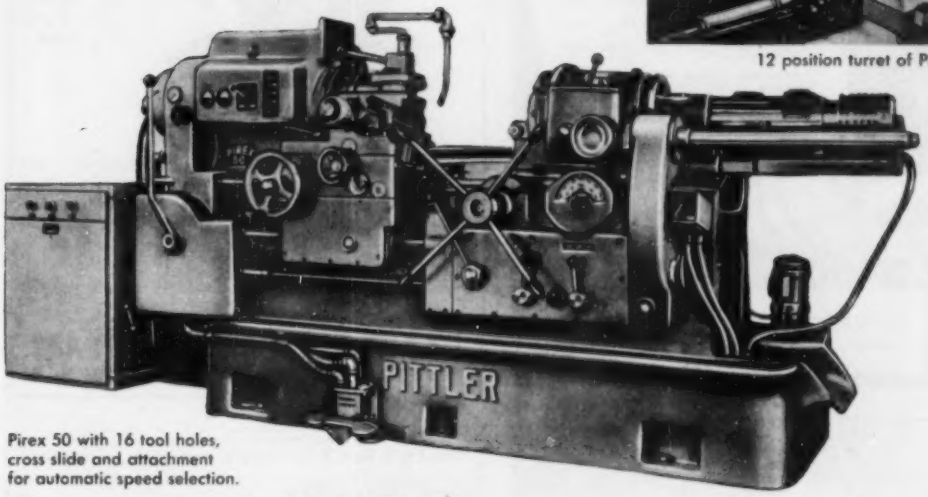


12 position turret of Pirex 32



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No. of Spindle Speeds		16	11
Spindle speed R.P.M.		71-1800	
Feeds		90-2250	18-1800
Longitudinal and transverse			
Fine	i pr	.001"-.009"	.001"-.009"
Medium	i pr	.002"-.020"	.002"-.020"
Coarse	i pr	.004"-.040"	.004"-.040"

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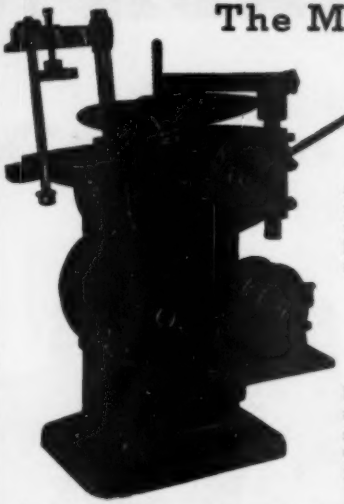

Illustration shows typical set-up for cutting taper keyways with table tilted.

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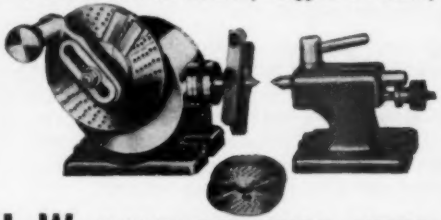

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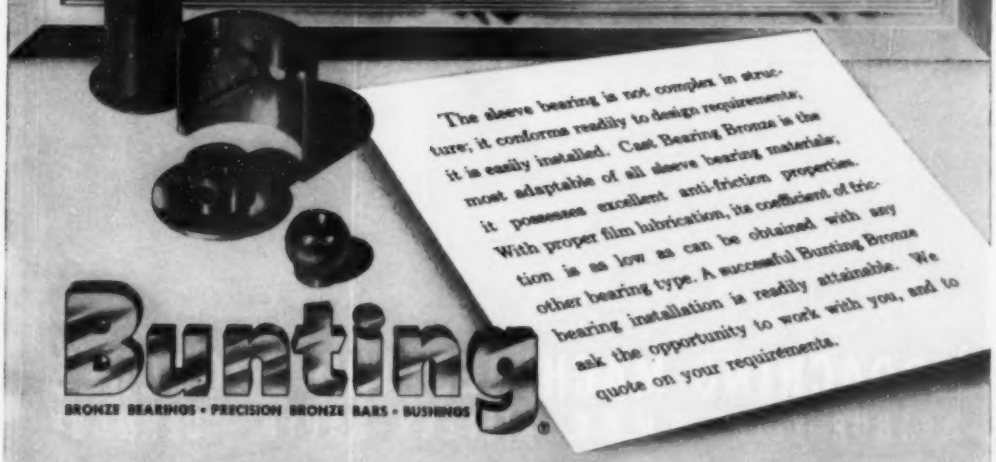
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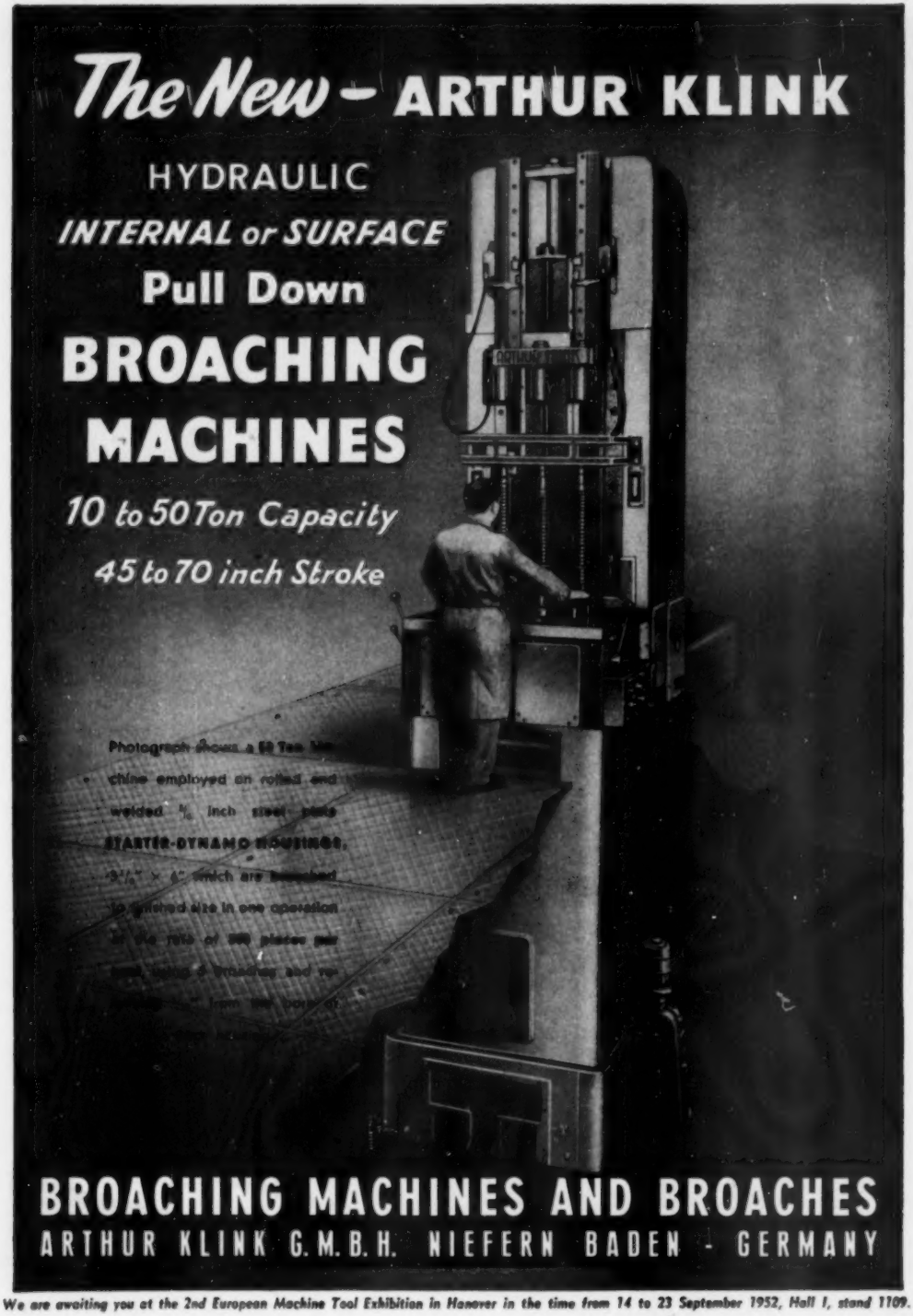

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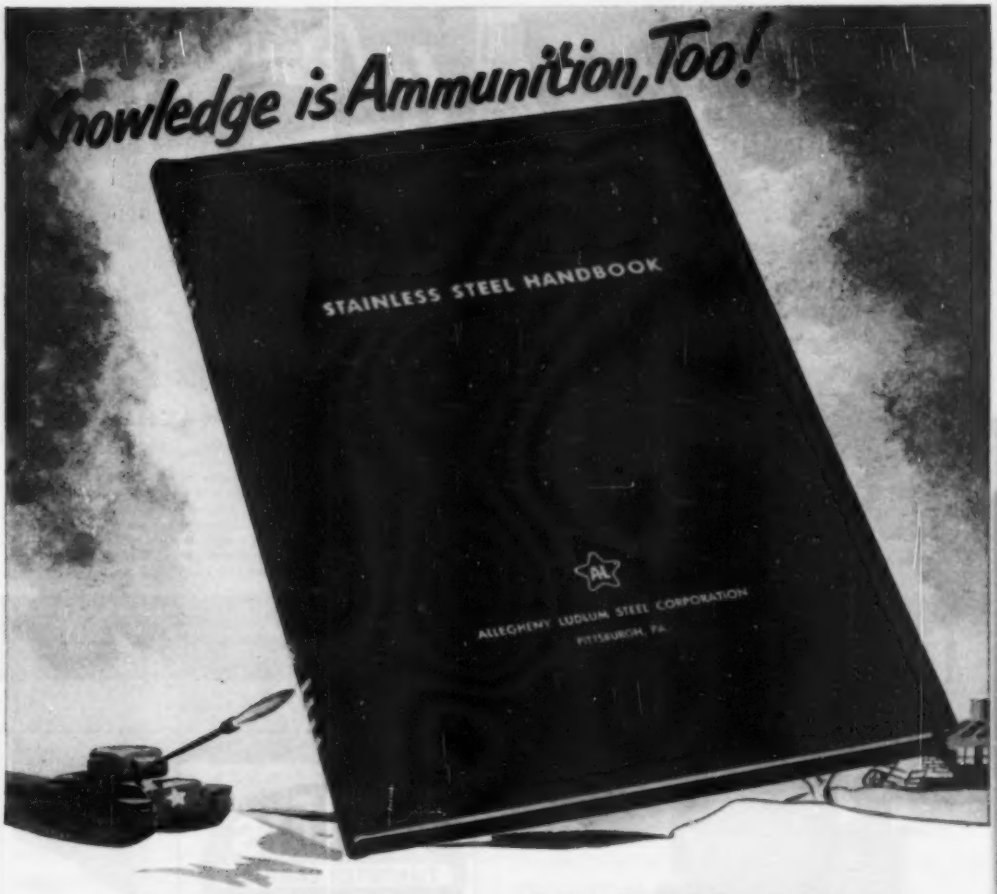

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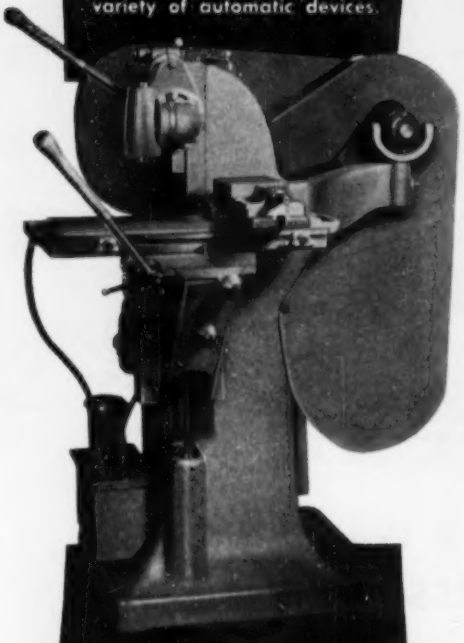

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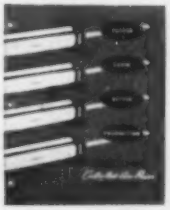

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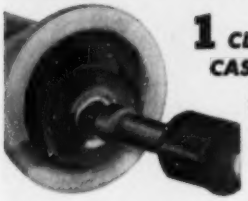
Pittsburgh Brushes Solved these Problems!



1 CLEANING RED-HOT CASTINGS in 30 seconds!

A Pittsburgh brush answered U. S. Pipe and Foundry's problem of cleaning red-hot castings. This rugged brush works 40 hours a week, turning out thoroughly cleaned castings at the rate of one every 30 seconds . . . a speed record for any brush cleaning operation of this type.

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Let Pittsburgh Engineers Solve Your Brush Problems.

Pittsburgh's complete line of brushes of every type, for every purpose, will provide a practical and economical solution of any brush problem you might have. Drop us a line on your company letterhead for a copy of our new booklet that shows, through actual case histories, how Pittsburgh can help cut your brushing operation costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-3, 3221 Frederick Ave., Baltimore 29, Maryland.

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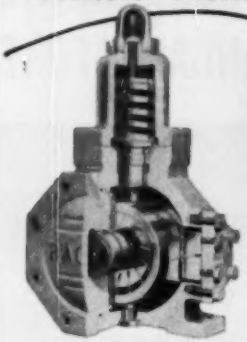

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See pages 64-65 June 9th, American Machinist

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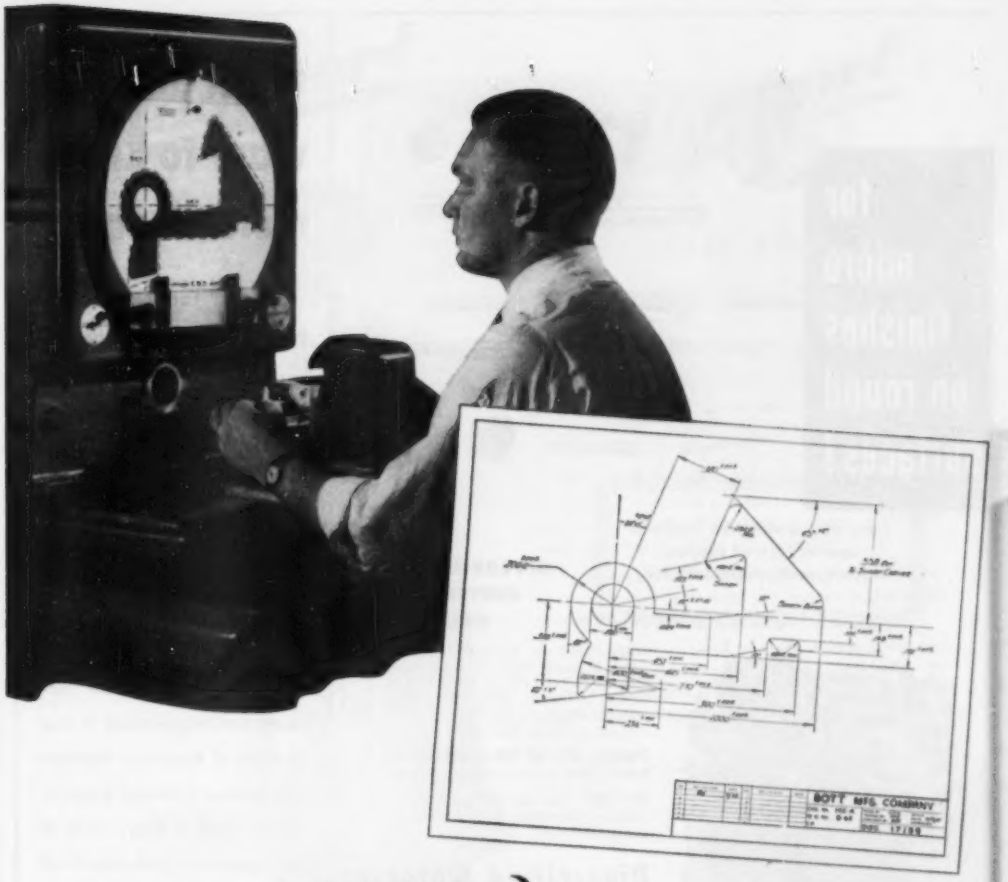

He checks 15 DIMENSIONS 8 RADII 7 ANGLES in ONE operation

To check this part completely and accurately by usual methods, you might need as many as two dozen or more different gages—and you still wouldn't be sure all corners were sharp, all angles and radii exact. There's a much faster, more accurate way to do the job completely, one that requires no mechanical gages that can lose accuracy through wear.

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The part we show here is a relatively simple one for an optical comparator. With proper fixtures, charts, and accessories, you can measure all sorts of complex parts, large or small. Changes in specifications generally require nothing more than a corresponding change on the chart.

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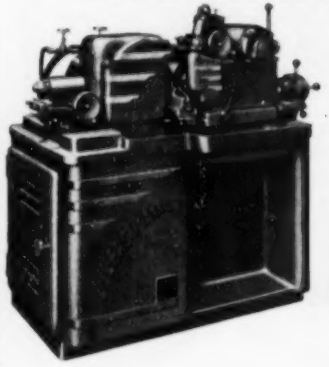

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DON'T underestimate the effect of an unsound sales budget on production efficiency. Inaccurate forecasts mean fluctuating schedules, a changing work force, and low worker morale.

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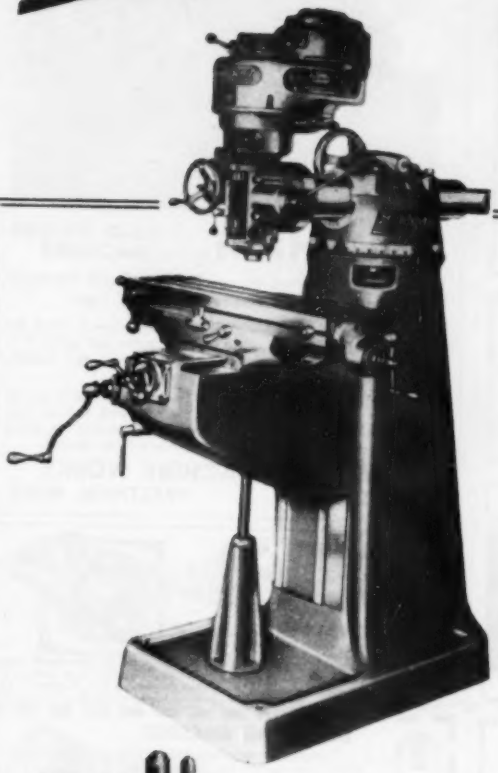
offers these advantages, economies and exclusive features:



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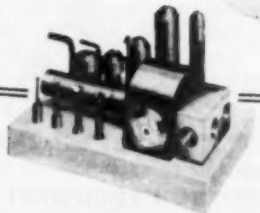

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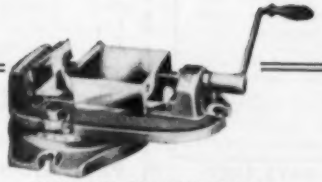

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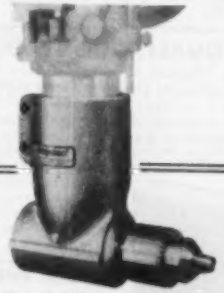

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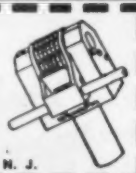

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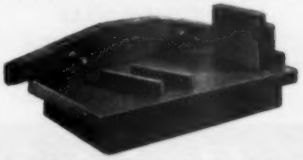

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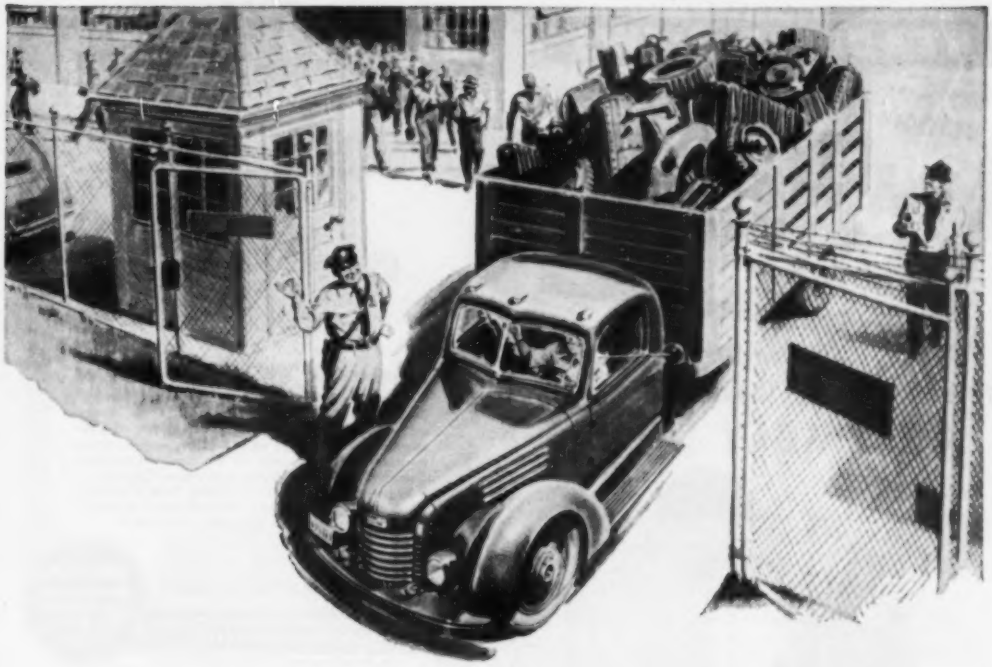

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See Pages 26-27
June 23rd, American Machinist

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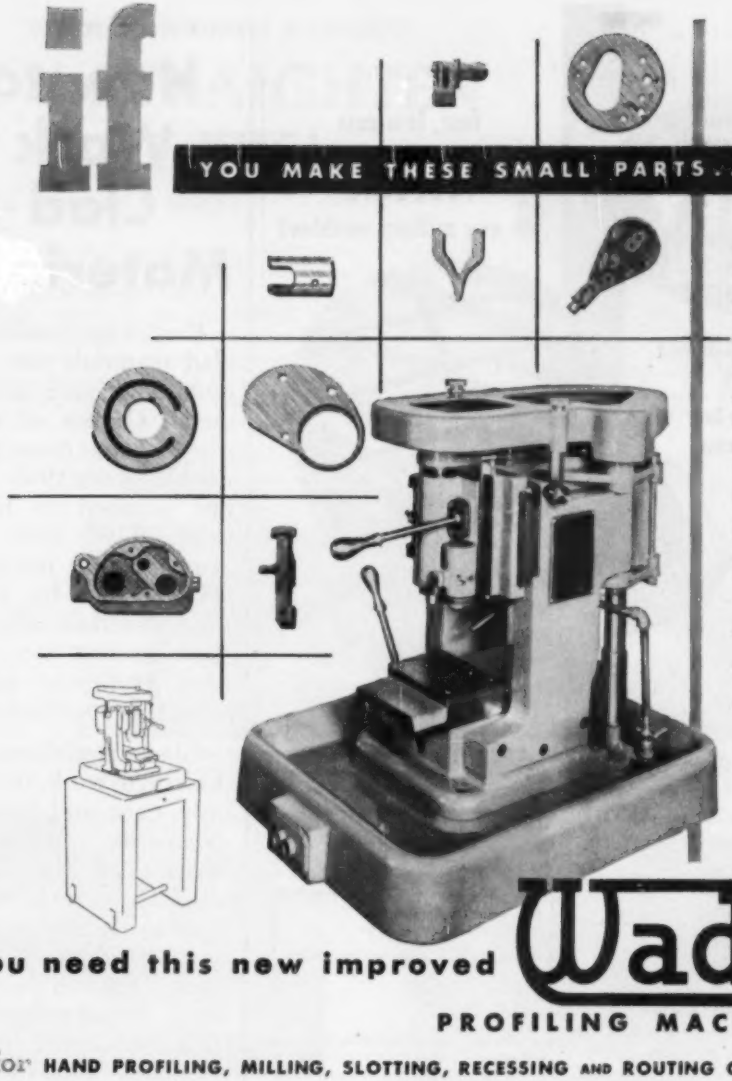

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Can be used on any milling machine without additional or special equipment. Set-up time is completely eliminated.

Use them for Automatic Cycle Milling . . . Cam Milling . . . Face Milling . . . as an Automatic Revolving Fixture . . . and for other special work to save costly time and labor.

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"QUEER DUCKS"—the men that don't fit the pattern—are also the men who don't think like the rest. They'll give you trouble, but they'll usually also give you ideas. Barnyard ducks conform readily to rules, but end up in a pot.

WATCH always for the jobs you *can't* do—well. Specialized equipment and specialized knowledge outside may be worth the extra cost in reduced scrap and headaches. Sometimes the price may be less too—and it costs nothing to get an estimate.

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YOU STRAIGHTEN BY EYE!

HERE'S HOW AND WHY:

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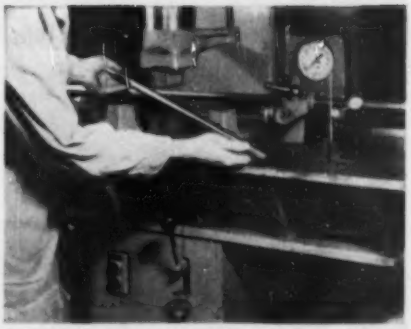
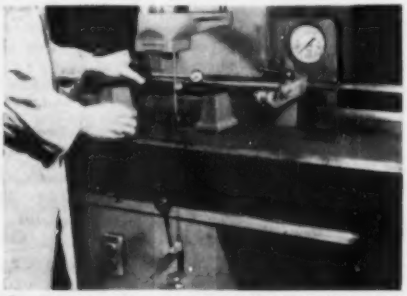


1. Rod to be straightened is placed in fixture on Hannifin 25-ton Straightening Press.* Centering fixture available.

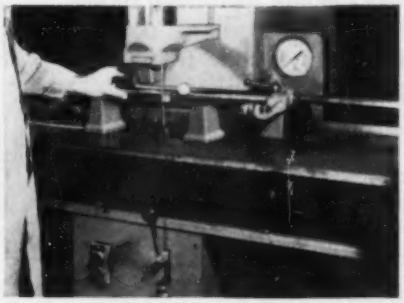


2. Operator rotates rod against deflection indicator. Dial reads .008 at point of maximum deflection.

3. Operator moves Sensitive Pressure Control slightly, ram moves down just enough to overcome springs of roller fixture and bring rod down on table blocks. (Note pressure gauge has barely moved off zero.)

4. Now operator "straightens by eye." Light finger touch bends rod just beyond yield point so it will take permanent "set" in desired direction. (Gauge shows press exerting force of 6 tons—but operator watches rod—not gauge.)

*While a much smaller press could be used for this particular job, notice how the extra sensitivity of Hannifin controls makes it possible to do a wide range of straightening work on a single press.



5. Sensitive Pressure Control is released and rod again rotated against indicator . . . deflection is .001, well within limits. Next piece!

NOTE: For simplicity, we have assumed that the operator got exactly the correction he needed on the try. While this often happens, the usual sequence is bend and try, bend and try. As you can see, however, successive bends can be made very quickly.

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6"x30" Cincinnati type ER, in feed
10"x18" Horton semi-automatic
23", No. 228 Hanchett opposed disc
30", No. 84A Gardner opposed disc
Nos. 5, 16-28 & 24-36 Bryant internal
No. 72 Heald Gagematic & Sizematic
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No. 3B Milwaukee plain
No. 33 Kempsmith Mfg.
24" Cincinnati duplex
42" & 84" Ingersoll rotary
48"x36"x10' Ingersoll adjustable rail
4", No. M80 Taylor & Fenn spline
8"x16" Hanson Whitney thread
41½"x12" & 6"x14" P.&W. thread
No. CT36 Lees Bradner thread

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No. 56½ Toledo straight side
No. 77½ Bliss S.S. trimming
No. 245½ Hamilton straight side
36", 88 ton Cleveland dbl. cy., hydr. clutch
Nos. 92½D, 93½C & 94½E Toledo dbl. cr.
600 ton No. 570 Toledo forging, air clutch
600 ton Hamilton forging
400 ton Ferracute EG54 coining
630 ton, No. 411 Hamilton toggle, hydr. clutch

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16" Smith & Mills shaper
24" Stockbridge shaper
24" Niles traveling head shaper
26" Smith & Mills shaper
27" Morton draw cut shaper
32" Ohio Dreadnought shaper
28"x28"x8' Gray planer
36"x36"x8' Cleveland O.S. planer
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36"x36"x12' Niles B.P. planer

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Niles 53" Vertical—42" under cross rail—36" under tool holders—MD

Betts 96" Vertical—60" under cross rail—Actual swing 100"—MD

Cincinnati 10' Vertical—Massive type—2 swivel heads—MD

DRILLS

Fosdick 5'10" Radial—Box table—Tumbler gear box—Right angle base—MD

Cincinnati-Bickford 7'22" Radial—Master type—Box table—Straight base—24 speed head—AC MD

Foote-Burt 4-spindle Rail Type—Length of rail 70"—Power feed—#5 Morse taper—MD

FORGING EQUIPMENT

United Engineering 3000 lb. Board Drop Hammer—New ram—Excellent condition

National 3" Upsetter—Strokes of headers 12"—Die space 17½"x20"—Work conveyor

Hilles & Jones #6 Guillotine Bar Shear—Cap. 5" round—Blades 10" long—MD

GRINDERS

Cincinnati 6"x18" Hydraulic Cylindrical—Saddle Type—Filmatic bearings—1940 machine

Landis 14"x36" and 16"x72" Universal—3-motor drives—Late types

Hanchett Rotary Surface—20" chuck—Dial gauge—Inching device—1941 machine

Heald 25A Rotary Surface—30" chuck—Max. swing 34"—MD—Late type

Brown & Sharpe #13 Universal Tool & Cutter—Cap. 8"x24"—1945 machine

Jones & Lamson TGG15 Automatic thread—Relieving attch—Wheel truing device—MD—Late type

MISCELLANEOUS

Keller BL2416 3-Dimensional Duplicator—Single spindle—Angle plate—Tracer spindles and tips—Generator set—1945 machine

GORTON 8½D Duplicator—Max. working area 10"x13"—2-speed MD—Tracer points and collets

Beatty #11B Heavy Duty Punch Press—350 tons ram pressure—9" stroke—MD

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AUTOMATIC, National-Acme 8gle. Spdl. 4¼".
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BORING MILL, 24" Gallard M.D., V.T.L.
BORING MILL, 36" Gallard M.D., V.T.L.
BORING MILL, 42" Gallard M.D., 2 Heads.
BORING MILL, 60" Betts Vert. 2 heads.
BORING MILL, 10" Cincl-Vert., M.D., 2 heads.
BORING MILL, Lucas #31 Horiz. 3" Bar, M.D.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar.
BARRELS, Tumbling Lapomatic, Baird.
BROACH, #3 LaPointe Horiz. 58" Str.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP., M.D.
COMPRESSOR, C-P 50 HP., M.D., (Quiet, 270 CFM.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New
COMP., Ing.-Rand ER-1, 100 HP Dyo. M.D.
CRANE, DET Rieker 2 tons 11'9" span.
CRANE, DET Shaw 10 tons, 58'8" span.
CRANE, Canton #9 Portable Gooseneck 2 ton cap.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CHIP WRINGER, 20" Talbert M.D., Late.
RADIAL DRILL, 5'x20" Cincinnati-Bickford, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'x13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 36" Walker Turner M.D., Late.
DRILL, Fosdick 19", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D., #4 M.T., M.D.
DRILL, #121 Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle., #2 M.T., 18".
DRILL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Nutco Multiple Spdle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MG Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILL, #2MB Leland Gifford, 4 spindle, #2 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
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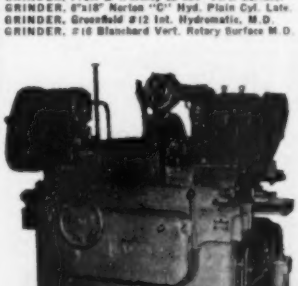
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, Oliver Type P4, Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.
GRINDER, #2 Cinc. Centerless, M.D. Thru Feed.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #286, 18" Dblo. End.
GRINDER, Heald Rotary #25, M.D. 10" Cap.
GRINDER, Hydraulic Contour Landis Cam 9"x40".
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ.12"x60".
GRINDER, Cylindrical, Cinci. 6x18 Filmatic, Late.
GRINDER, Thread, Jones & Lamson #TG-815, Late.
GRINDER, Landis Crankshaft 10x32 Hydraulic, M.D.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, 6"x18" Norton "C" Hyd. Plain Cyl. Late.
GRINDER, Grueafield #12 Int. Hydromatic, M.D.
GRINDER, #16 Blanchard Vert. Rotary Surface M.D.



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GRINDER, Oliver Auto. M.D. Drillpointer.
GRINDER #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4½".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, Porter-Cable #6-3, 10" Belt, M.D.
GEAR HOBBER, #1 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 10" dia. M.D.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.
HAMMER, Rochester Hispeed, all sizes M.D.
HANNER, Bradley 2000# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
INDUCTION HEATER, 18 KVA, Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #104 Barnes Vertical, M.D. Hyd. Late.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 27" Norton Vert., M.D., late type.

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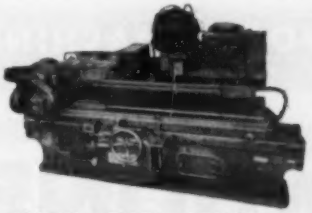
Osterheim 37" Wheel Diameter Disc Grinder. 40 HP. TEFC 3,600/440 spindle motor drive. 24" capacity.



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LATHE, Lehman 18"x7' Q.C.G., M.D.
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LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
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LATHE 4"x12' Springfield Grd. Hd., M.D., Taper
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x10' Q.C.G., Grd. Hd.
LATHE, Bulling Dble. End #YMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret #2 Bardons & Oliver Late Type, M.D.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1¼".
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LATHE, Turret #59 Hardinge 2nd operation, late.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL, 30 N. Sundstrand Horiz. Hyd. 2 Sp. M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #8Y Brown & Sharpe Plain Horiz., M.D.
MILL, Cinc. Horiz. #3, #4, #5 High Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #9-D Cinc. Vert. & Horiz. Prod. Late.
MULT-MILLER, U.S. Tool #MM-1-S, Auto. Prod.

LANDIS 10 x 32 Crankshaft Grinder.

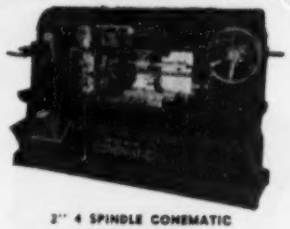
MILL, #6 Vanese Hand Mill, M.D. Late.
MILL, PLANER, Ingersoll 42x30x12, 4 heads.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #3 Cinc. Univ. Horiz., M.D. High Power.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex, M.D.
MILLING MACHINE, K & T #2B Horiz., M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 KW.
NIBBLER, Gray Turret Type 1/4"x24" cap. M.D.
NIBBLER, #2 Savage Roller Die 5/8"x36" cap.
OZALID Model "F" Whiteprint Machine, Late.
THREADING, Stayknit Lassiter Millholland 1½".
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Pine-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
PLANER, 48"x48"x12' Cleveland Openside, M.D.
POWER PRESS, Bliss #100 Open Back, M.D.
POWER PRESS, Bliss #3A, S.S. Dble. Crank Grd. 45 tons, 4" stroke, 30"x24" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #188-S Straight Side Dble. Crank 45 tons, M.D.
PRESS, 133 ton Clearing Single Crank 8" Str., Late.
PRESS, 70H Drake Hydraulic Arbor, New.
PRESS, #75½, Bliss S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 60 tons #3W.
PRESS, #8C Bliss Double Action, 3 crank.
WHEEL PRESS, Chamberaburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #60 Whitney Deep Thr. 24", Vert.
PRESS, P2, P1 Ferracute M.D. Nail Feed.
PANTOGRAPH, #1A Garton M.D. Engraving.
PUNCH, R-41-P Wiedemann Turret, 14 stat. 24" thr.
PUNCH, Hasker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 8gle. End. 24" Thr. 1" thru 1".
PUNCH, H & J #5 8gle end. 48" Thr. 2" thru 1½".
RIVET SETTER, ¾" cap. Pneu. Tubular Rivet.
ROLLS, Bartsch Pyramid 18"x1¾" cap., M.D., Late.
ROLLS #1 Buffalo Forge Wrapping, M.D.
ROUTER, #W1400, Geared, Electric H.D.
COLD SAW, Kopen-Lucas #780, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #48 Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #6 Marvel Band 18"x18" cap., M.D.
SAW, #302 Campbell Abrasive Cut-off, M.D.
SAW, #29-C Racine Shear Cut 6"x6" cap. M.D.
SAW, Band, Tannewitz & GH-30" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20 "Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci. S.S., Motor driven.
SHAPER, Columbia 32" S.S. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, Quickwork #-1 Rotary 09" Throat, 18 ga.
SHEAR, #8E Niagara M.D. 8'x3/16" cap. M.D.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 50 tons, 2½" cap. M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
WELDER, 300 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OTHER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

RELIABILITY has been earned by WIGGLESWORTH MACHINE TOOLS

AUTOMATICS

2⅝" Cone, 4 spdls., well equipped, 1936
4½" Cone, 4 spdls., Lw, late, excellent
#24 New Britain 4 spdle. chucker, 2½" cap.
¾" Model F Gridley, 4 spdle.
1½" Billings & Spencer Dimatic Cutoff
#4 Brown & Sharp single spindle 2⅛", late



2" 4 SPINDLE CONEMATIC

BORING MILL

42" Bullard New Era, side and rail head

GRINDERS

14" WD Hammond dble. end, carbide
#44 Heald carbide
10x18" Landis type CH plain cylindrical
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
#76RA Rogers knife grinder, 76"
P & W deep hole drill grinder, late
Oliver single point tool
Model 1311 P & W contour, late

#106 Rivett Internal
5 HP Marschke, single end

DRILLS

4'11" Western radial, enclosed head
#12 Minster Jr., #5 M.T., box column
#2LMS Leland-Gifford, 24", hydraulic
#24 Footburt, 3 spdle., #5 M.T., 24"
#2 Allen, 2, 4, 6 spdle., #2 M.T.
36" Synder single, #5 M.T.
#2 Detroit Semi-automatic, horiz.
Type 14 Natco 12 spindle
Model 4230 Bodine Drill & Tapper, 12 sta.
Mallory Hole Hog, 2 spindle
4'15" Carlton Radial, 1942, Rebuilt

GEAR MACHINERY

#13LS Fellows lapper
7A Fellows, shaper, high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES & TURRETS

30"x10' American geared head, taper att.
33" Niles vertical wheel, 1930
48" Niles vertical wheel, side and vert. head
#7 Foster ram type universal, 2½" bar, 1938
#3 Morey Universal, air chuck, late
#1A W&S Univ., serial 260313
#2 Simmons Microspeed
#4 W&S, serial 327317
Hepburn Shell
Gisholt Simplimatic, platen type
40"x25' centers LeBlond Heavy Duty, geared head, 1948.

SHAPERS & PLANERS

24" Cinn. Universal shaper, late, rebuilt
48x48"x10' Gray dble. hsing., 3 heads
30"x30"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone
84"x84"x24' Gray, double housing, late

MILLS

#3 B & S vertical, geared head
#3 Sundstrand Rigidmill, horiz.
Bryan production, hydraulic
10C Van Norman Contour

THREADERS

#50 Excello Precision grinder, 28x68"
TG185 J & L Internal grinder, 12 x 18"
13" Automatic Machinery miller, late
Model 40 Lees Bradner mill, 6½" hole
#2 Dotzen grinder, 3" o.d. cap., late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type

FURNACES

Whiting Converter, 2 ton cap., late
Model SP Juthe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES

#3 Koehler OBI, 18 ton, 2" stroke
#78½ Bliss straight side, 350 ton, sgle. crank
Ferracute type EG-52 embossing, 150 ton
Lucas 50 ton straightening, 24½" stroke
#57 Toledo, 150 ton, s.s., s.c.
#4 Toledo OBI, 25 ton, 2" stroke
#2½ Niagara OBI, 45 ton, 2½" stroke
#29 Bliss arch frame punch, 32 ton, 2" str.
General Flexible power arbor, 5 ton
100 ton Niles wheel press

MISCELLANEOUS

HAMMER: 4000# Erie Steam, sgle. frame, late
KEYSEATER: #6-38 Mitts & Merrill, 4 x 36"
PUNCH: Southwark sgle. end, 2" thru 1"
SPINNING RIVETER: Grant 5 spdle.
LAPPERS: 86-36" Gardner, vert. spdle.
HAMMER: 300# Bradley Upright Helve
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZERS: #2 Ajax High Speed, 30 ton

T. R. WIGGLESWORTH MACHINERY COMPANY

1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

HEADLINERS

MILLING MACHINES

No. 2 Kempsmith Universal, Turner Drive, vert. hd., slotting attach.
No. 2B Heavy Brown & Sharpe Plain
No. 3 Kempsmith & Universal, Lima Drive
No. 3A Brown & Sharpe Universal
No. 4 Cincinnati High Power Universal
No. 4B Heavy Brown & Sharpe Plain
48" Cincinnati Plain Automatic

LATHES

36"x96" centers Boye & Emmes, cone
30"x174" centers Hamilton, Lima Drive
24"x60" ctrs American Hvy. Pat. 12-speed Grd. Hd., taper
21"x136" ctrs LeBlond Hvy. Dty., Turner Drive, taper
20"x94" ctrs American Grd. Hd.
16"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
14"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
No. 608-PV Rivett Precision Toolmakers

PLANERS

36"x36"x10' Cincinnati, 2 hds., box table
42"x42"x14' Niles-Bement-Pond Hvy. Pat., box table, 4 heads
48"x48"x12' Niles-Bement-Pond, 4 heads
60"x60"x32' G.A. Gray, 4 heads, excellent

TURRET LATHES AND AUTOMATICS

1⅜" Cone 4-spindle Automatic, bar feed
3"x36" Jones & Lamson "Hartness" Turret, bar feed, lots tooling, clean

GRINDERS

20"x144" Landis Plain Self-cont., grr. m.d.
10"x24" Landis Plain Self-cont., m.d.
10"x24" Norton Plain, m.d.
6"x32" Norton Plain, m.d.
No. 10 Brown & Sharpe Plain, m.d.
No. 49—53" Besly Vert. Spdle. Surface, m.d.
No. 5A Bryant Hydraulic Internal, late
No. 2 Norton Motor Driven Universal Tool & Cutter
No. 14-20 Gardner Opposed Type Disc

GEAR MACHINERY

No. 1 Adams Hobber, grr. m.d.
No. 2 Barber-Colman Hobber, m.d.
No. 5A Cincinnati 60"x16" Cutter
No. 12 Barber-Colman Hobber, m.d.
11" Gleason Str. Tooth Bevel Gear Generator
No. 18HM Gould & Eberhardt Double Spindle Hobber, s.p.d.
18" Gleason Str. Tooth Bevel Gear Generator, s.p.d.
18" Gleason Bevel Gear Tester
No. 7 Fellows High Speed Shaper, m.d.
No. 61 Fellows Gear Shaper, m.d.
12" Gleason Bevel Gear Planer, cone

PUNCH PRESSES

No. 2 VKV, O.B.I.
No. A3 Robinson O.B.I., grr. m.d. 32-tons
No. A4 Robinson O.B.I., m.d., 56-tons
No. 77 Toledo Open Back, b.d.
No. 2DT CANCO Deep Thrt. Horning m.d.
No. 5H Cleveland Horning, grr. m.d.

MISCELLANEOUS

10" Dill Slotter, m.d.
20", 24", 28" Gould & Eberhardt Shapers
No. 14½ W&W Punch & Shear
Class F Bertsch Punch & Shear
18" Niles-Bement-Pond Slotter, cone
200 lb. Bradley Compact Hammer, b.d.
2½"-6" Cox Pipe Machine, m.d.
1½" Landis 2-spdl. Bolt Thrd., m.d.
2½" Landis Long Bed Stay Bolt Threader, cone, leadscrew

Send us your inquiries.

COX MACHINERY COMPANY, INC.

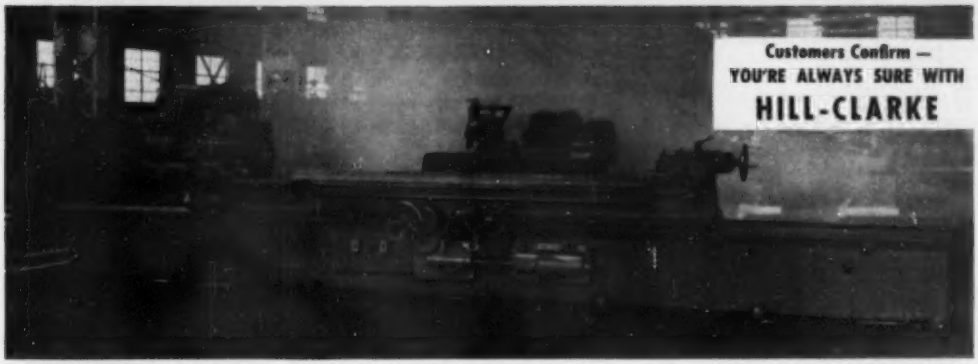
3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1, OHIO

Office&Warehouse 311-313 Bakewell St., Covington, Ky.

HILL-CLARKE MACHINERY COMPANY

ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary



24" SWING x 144" CENTERS NORTON GRINDER GAP 35" SWING x 18¾" WIDE Photographed at our plant where it can be inspected.

AUTOMATICS

⅜" G Model Gridley
1-1/16" Model A Cleveland (1942)
1¼" Foote Burt (1941)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1 Spdl—24" Sw—No. 2 MA6 Avey.
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey.
D-31 Fox Multiple Drill, No. 2 Taper.

GEAR MACHINES

No. 12-H Gould & Eberhardt Hobber
No. 12HS Gould & Eberhardt Hobber.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

72" Niles—Hvy. Pattern

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 81 Heald Int. Cen.-Sizematic
No. 74 Heald Internal Centerless
No. 44 Excello Carbide Tool Gdr.

LATHES

19"x' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.

MILLING MACHINES

No. 08 Cincinnati Vert.
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
No. 175 G. T. Schmidt Marking Mach.

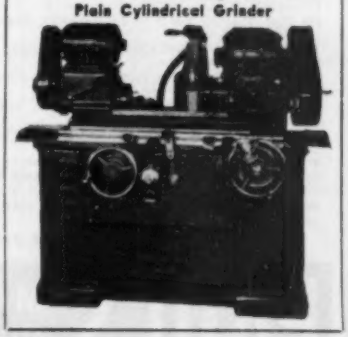
PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

Attention!

OF SPECIAL INTEREST

6" x 18" Norton Hydraulic Plain Cylindrical Grinder



FULL MONEY-BACK GUARANTEE

1. Hill-Clarke always gives you an unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for RE-MANUFACTURING machine tools in our 55,000 sq. ft. plant.
5. A responsible organization—with eighty-two years experience.

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

ARBOR PRESSES

No. 37E Wilson Hydraulic, hand operated, 58 tons, new
King Screw Press, s.p.d.
No. 1 Greenard Arbor Press, floor type, hand operated

AUTOMATICS

4 spindle 1½" Conomatic, m.d., bar, 1942 machine
No. 6A Potter & Johnston, m.d.
No. 8C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
4 spindle 2¼" Cleveland Model "K", m.d.
2½" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7½" Cleveland Model A, m.d.
No. 6A Cleveland, m.d., 8" cap., latest
No. 50 Potter & Johnston, m.d.

BOLT THREADERS

½" Style R Economy Automatic Threading Machine, belt
Victor Nut Facing Machine, m.d., cap. ½" to 2" nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type

HORIZONTAL BORING MILLS

#31 Lucas, m.d.
Barrett Double End, 5" and 7" spindles, m.d.
3½" bar Landis Floor Type, m.d.
4" bar Detrick & Harvey Floor Type, m.d.
4½" bar Niles Table Type, m.d.
5½" bar Niles, m.d.
10" bar Sellers, Floor Type, m.d.
Pair Tables for use on Floor Type Horiz. Boring Mill, 8'0" long x 17½" wide x 38" high, 3 T slots
Pair Tables for use on Floor Type Horiz. Boring Mill, 8' long x 18½" wide x 33" high, 2 T slots
Floor Plate consisting of box type Planer Table, 21' long x 48" wide, 12" thick

54"x11' Rectangular Table, 40" high
Rotary Table, 60" dia. made by Ingersoll

VERTICAL BORING MILLS

24" Bullard New Era, m.d.
42" Bullard Spiral Drive, m.d.
42" King, m.d.
48" Colburn, m.d., 2 swivel heads
100" Niles Heavy, m.d., p.r.t.

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new

RADIAL DRILLS

2½' Fondiek, gear box on base
3' American Sensitive, same
3' American, m.d., box table
4'-13" cal. dia. Cincinnati-Bickford Super-Service, m.d., late
5'-12" cal. dia. Dresse, gear box, m.d.
Zeus Precision Universal Bench Type Radial, m.d., new

BALL BEARING DRILLS

Canedy-Otto Bench Type, 5" overhang
Allen Bench Type, m.d., ⅓ H.P. 12" overhang
Mason Bench Type Single Spindle, belt
Providence Engineering Co., Model E, s.p.d.
No. 1½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 4 Fondiek, 5" overhang, belted m.d., No. 2 Taper
1 spindle Allen, belt drive
2 spindle Allen, belted m.d., 8" overhang
2 spindle Avey, size No. 1 Type B, style VHP, m.d., 6" overhang
2 spindle No. 3 Avey, belted m.d., p.t.
21 LMS—5 spindle Leland & Gifford High Speed, late, m.d.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang

6 spindle Leland & Gifford, No. 2 Taper, m.d. on each spindle
6 spindle No. 2B Edlund, m.d., No. 2 Taper
6 spindle No. 3 Avey, belted m.d.
6 spindle Henry & Wright, m.d., 13" overhang, No. 2 Taper

HORIZONTAL DRILLS

Natco 1 spindle Horizontal Hydraulic Hole Unit, m.d.
3 way Natco Horiz. Drill, consisting of 3 E13 Hole-units
No. ½-8x30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. ½-8x30" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 18x74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x180" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x100" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., older type
5 spindle Detroit Semi-Automatic, belt
Special Horiz. Drilling Machine, Cincinnati-Bickford Head mounted horiz. on base

MULTIPLE SPINDLE DRILLS

C12 Natco, m.d., 18x18" head
No. 3 Baush, m.d., 18x30" head, 15 spindles
No. 3 Baush, m.d., 20x40" head, 15 spindles
No. 10 Foote-Burt Fixed Center, m.d.
3 spindle 12" Rockford Gang, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 28" Cincinnati-Bickford Upright, m.d., No. 4 Morse Taper
4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper

WRITE FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

IMMEDIATE DELIVERY

ROLLER LEVELLERS

McKAY ½" TO 2" FOUR-HIGH LEVELLER, 15" Diameter Rolls, (9) Leveling Rolls, (11) backing up rolls, (2) Pinching rolls, (1) 300 HP motor for main drive, (2) 10 HP motors for screw down and (1) 2 HP motor for pinch roll adjustment.

McKAY ¼" TO 2" TWO-HIGH LEVELLER, 13" Diameter Rolls, (11) Levelling rolls, (2) Pinching rolls, with (1) 150 HP motor for main drive, (2) 7½ HP motors for screw down.

ABOVE MACHINES ARE NEW IN 1943, SELLING FOR 1/5 OF NEW COST, USED ONLY 6 MONTHS

PUNCH PRESSES

1400 TON COMBINED CAPACITY, BLISS #2 ET-10 TRIPLE ACTION TOGGLE, 650 ton, 39" stroke, 75" shut height of plunger, 400 Ton, 28" stroke, 72" shut height of blankholder, 350 ton, 12" stroke of lower ram, 62" x 86" bed area.

525 TON, BLISS #418A DOUBLE ACTION TOGGLE, 25" stroke, 62" shut height of plunger, 17" stroke, 60" shut height of blankholder, 60 x 84 bed area.

288 TON, TOLEDO #86-D DOUBLE CRANK, STRAIGHT SIDE, 6" stroke, 30" shut height, 51 x 87" bed area.

180 TON, #7-D CLEVELAND DOUBLE CRANK, STRAIGHT SIDE, 18" stroke, 32" shut height, 40x84" bed area.

125 TON, TOLEDO #S-56 TWIN TYPE O.B.I. PRESSES ON S.S. BASE, 3" stroke, 25 x 25" bed area, 12½" shut height.

88 TON, TOLEDO #92½ DOUBLE CRANK, GAP FRAME, 2¼" stroke, 38" x 53½" bed area, 9¼" shut height.

80 TON, BLISS #4D DOUBLE CRANK, GAP FRAME, 2¼" stroke, 38 x 53½" bed area, 9¼" shut height.

87 TON, BLISS #4½ STRAIGHT SIDE, 4½" stroke, 21 x 27 bed area, 14½" shut height.

75 TON, WELLS DOUBLE CRANK GAP FRAME, 2" stroke, 20 x 80" bed area, 11¼" shut height.

60 TON, TOLEDO #205-E DOUBLE CRANK GAP FRAME, 4" stroke, 13 x 55½" bed area 16" shut height.

MANY OTHER PRESSES IN STOCK FROM 5 TO 1400 TON CAPACITY

PAUL'S MACHINERY CO.
6111 VERMONT AVE. TYLER 7-6300
DETROIT 8, MICH.

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads, 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11, 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 Columbus 16, Ohio

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES
ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ⅛ B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES
BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: #4 Enveloping Gear Cutter
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 8" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: #18 Spiral, Zerol & Hypoid, capacity 24" P.D.

GEAR FINISHERS & TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: #18 Spiral, Zerol & Hypoid, capacity 24" P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL
BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE
ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD
EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES
BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¾" to 1" dia.

LAPPING MACHINES
FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION
AMES: 1" Bench, with attachments (New)
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
Reinecker Relieving Lathe, (new)
H.E.B: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET
WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
HERBERT: #2, #4, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES
CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

PRESSES
GEN. FLEX: Screw Press, 3 ton

SAWS & CUT-OFF MACHINES
CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
WILLIAMS: 16" Pipe & Tube Cut-Off

SHAPERS
HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS
HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES
BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS
CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Pipe & Tube, 16" Williams
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw. Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
PUNCH SHAPERS: Sentinel Shrewbury, Thiel type design (New)
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 22" (New)
GRINDER: WICKMAN Optical Profile Form Grinder (New)
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

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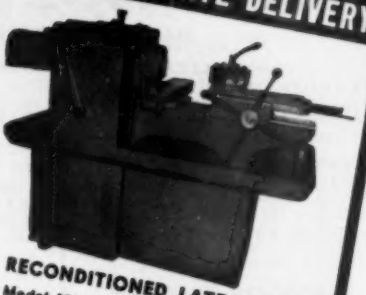
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY



RECONDITIONED LATE TYPE
Model 601 W.D. Oster Turret Lathes
(Several)
For Bar and Chucking Work

A high speed, simplified machine capable of handling a wide variety of turret lathe work as efficiently as many more complicated and higher priced machines, and with less skilled operators.

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THE FOCAL POINT FOR PRODUCTION MACHINERY

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-4 1¾" Acme-Gridley, 1943
1-1/16" Model "A" Cleveland, 1941
No. RA-6 9/16" Acme Gridley, 1942

AIR COMPRESSORS
75 HP Gardner-Denver Air Compressor

DRILLS RADIAL
3'11" Archdale Radial (English), 1942

GEAR EQUIPMENT
No. 7 Gleason "Revex" Rougher, 1943
No. 6 Gleason Revacycle Generator, 1940
No. 72 Fellows H.S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, 1942
15" Rod Ring External Gear Lapper, 1942
No. 7 LB Fellows Gear Lapper, 1944
Red Ring Universal Gear Checker, 1942
20DM Fellows Rod Liner Gear Tester, 1942
No. 12 Gleason Tool Sharpener, 1943

GRINDERS CYLINDRICAL
14"x108" Norton Plain Type "C", 1942
15"-20"x36" Norton Plain Type "C", 1942
14"x60" Landis Plain Type C, 1943
12"x60" Fitchburg Plain Hyd. 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS INTERNAL
No. 72-A2 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 16 CP 10 Bryant Hydraulic, 1942
No. 10-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic Disp. 1940
No. 4 Bryant Internal, 1940

GRINDERS RADIUS
No. 73 Van Norman Radius Grinder, 1942

GRINDERS SURFACE
No. 22 Heald Rotary 22" Chuck, 1944

GRINDERS THREAD
No. 28A Excello Internal Thread Grinder, 1943
No. 21 Excello Precision Thread Grinder, 1942

GUN BARREL MACHINES
No. ½-8x30 Pratt & Whitney Rifler, 1942
No. ½-8x30 Pratt & Whitney Reamer, 1942
No. ½-8x30 Pratt & Whitney Reamer, 1942

HAMMERS
No. 2B Nazel Forging Hammer, 1942
200 lb. Bradley Helve Hammer, 1942

LATHES ENGINE
36"x20" American Geared Head, M.D.
23"x120" Oldfield Schofield, New
24"x120" Lodge & Shipley Cone
14"x30" Bradford, 1942

LATHES PRODUCTION
No. 3FU Foster "Fastomatic" Platen Type, 1942
No. 5D Potter & Johnston Automatic, 1943
No. 4D Potter & Johnston Automatic, 1942
8"x24" Lo-Swing Semi-Auto.
8"x108" Lo-Swing Semi-Auto. AC-MD
Lipe-Carbo-Matic Lathe, 1942

LATHES TURRET
24" Bullard Vertical, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. 4R Gisholt Universal Saddle Type, 1943
No. H5 Libby Universal Saddle Type, 1930
No. 5W Acme Universal Way Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942
No. 4 Gisholt Simplified, 1941
No. 1 Warner & Swasey Electric Head, 1940

MILLS TOOL ROOM
No. 4B Milwaukee Plain, M.D.
No. 3 Cincinnati Vertical, M.D.
No. 2 Kempsmith Vertical Maximiller,
ALS Alcera Plain Mill (No. 2 Sibe), New
No. 2 Rapid Universal Mill, New
FPN 3B Mathey Vert. Mill, New

MISCELLANEOUS
No. 50A Quickwork Rotary Shear, 1943
2000 HP Midwest Dynamometer, 1942

PLANERS AND SHAPERS
52"x36"x40" Cincinnati Planer,
26" Ariston Shaper, New
24" Iowieta Shaper, New
21" Ariston Shaper, New
20" Smith & Mills Crank Shaper, 1942
16" Iowieta Shaper, New

PRESSES
600 Ton Verson Double Action Eccentric, 1940

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. • • Indianapolis, Indiana

POWER PRESSES —HYDRAULIC

500 Ton Woods, 4 Column 7½" diam. Stroke 24", Daylight 48". Bed area 8' x 6' bet. columns. Diam. of Ram 23". 2 Pull backs 20½. Pump and motor.

350 Ton Southwark. 4 columns, 7" diam. Stroke 24", Daylight 76". Bed area 8' x 5' overall. Diam. of Ram 38". Air Cushion 60" x 56½". Less Pump and Motor.

Photos and details upon request

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REFRIGERATION UNITS

Two Practically New Worthington Carbondale Refrigeration Compressors

300 Ton Freon
Ideal for large plant or office building
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Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 32, 3" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vert.
New 3" Hor. Bor. Mills

DRILLS AND RADIALS

American 6'x15" Univ.
Bausch Multi-spindle
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x15" cal.
Natco #12 20 spindle drill, Bausch
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" cap.
Leland Gifford 2 LMS 3 MS

ENGRAVERS

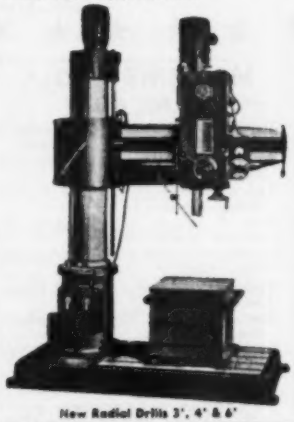
Deckel type 3 Dim., New
Gorton #1A, ME, Deckel GIL
Taylor-Hobson 3 dim.

GEAR EQUIPMENT

Barber-Colman #2, #12 (3), Flather 72" Cutter
Fellows High Speed Shapers 712, 725, 71
Fellows #20M Redliner
Flather 72" Cutter
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap.
National Broach Red Ring Lapper
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

Bryant #5, Internal, chucking, 16A16
Cincinnati 6x18" Cyl. Hyd.
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagomatic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 18x24 Univ.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.



New Radial Drills 3', 4' & 6'

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shaper 7" Amco, 8" Shaperite — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes Motors, Grinders, Buffers.

150 Ton H.P.M. Triple Action Press 50 ton cushion, 50 ton blankholder, bed 36" x 36".

Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Sellers 6T Tool, K.O. Lee tool
Van Norman #646 Crankshaft
Wicaco Internal

GRINDERS, SURFACE

New 8x24" Hyd. Feed
Abrasive 8x24", #33 Vert. & #34
Parkman 12" Chuck Rotary
Blanchard #16, 26" Mag. Chuck
Gallmeyer & Liv. #55, 8x24 Perm.
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd.
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base
Taft Pierce #1 Precision

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #3 Duomatics
Handey 12"x42" and 12x30", 1941, 16x66"
Handey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Carbo 12"x18" (2)
Monarch 14x30", Late, P. & W. 16"x60
Sebastian 12"x4' G.H., Sheldon 12"
Wickes 32"x15' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15" 15" Stub
Rivett Model 918 Precision
New 16, 18, 20", 28" Immediate Del.

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14", Prod.
Brown & Sharpe #38 Plain, Late, 3A, 21, #21
Cinc. No. 3, 4 Plain Spd.
Hardinge Mod BB4, Kent Owens 1V, 1-8, 1-14, 1M
Milwaukee 2K, 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill #1A
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ.

MILLS, VERTICAL

Brand New Vertical Mills
Brown & Sharpe #3 single pulley drive
Cincinnati #3, #4 hi-power
Cincinnati 00 Vertical
Jackson, Reed Prentice
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

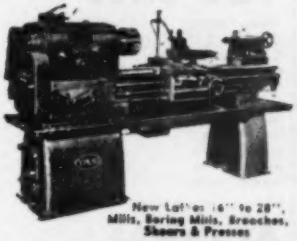
Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 38, 62, 162, OB,
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
Bliss 5-48 Obl. 32x48" bed, Cushion
Toledo 92½c Dbl. Crank 43x23" bed.
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herring, 15 Ton
Niagara A1¾, O.B.I.
Toledo 29 Double Action Cam
V & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic
Jones & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, 3, #4 Preselector

MISCELLANEOUS

Automatic, Cleveland Model B 1-1/16", A
Automatic B & S #00G, 0G
Automatic 4 Sp. 1⅛ Conomatic
Band Saw: DoAll Zephyr 36", 16" Metalmaster
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Broach: 3L LaPointe Hydro. Horiz. New Klink. 6 Ton
Hacksaw: Peerless 6"x8"
Honer: Micromatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Shaper: 24" Rockford, 24", 28" Gould & Eberhardt, Cinc. 20, 24"
Shears Power: George Ohl 10' 3/16", 10' x 16 gauge, 11' 14 gauge
Welder: 50 KVA Elsler Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave



New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

150 Ton Triple Action HPM Press
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
8 and 9 oz. Injection Motors

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 28"x20" Platen 8" St. 19" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS

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US EQUIPMENT CO. DETROIT OFFERS IMMEDIATE DELIVERY ON THESE 1941 AND LATER BARGAINS

GRINDERS

23x36" Norton O.D. Cylindrical Grinder, 1940
10x36" Norton O.D. Cylindrical Grinder, 1941
10x36" Landis O.D. Grinder, Semi-Automatic, 1941
10x36 Landis O.D. Grinder, 1940
No. 12 BAS cylindrical grinder 6x30, plunge cut, 1945
6x18" Landis O.D. Grinder, Semi-Automatic, 1944
4H Landis plain hydraulic grinder, 1942.
6x18 Norton Vertical Surface Grinder, 1942
1½ Abrasive Surface Grinder, 1942
16 C 16 Bryant Internal Grinder, 1942
#5A Bryant Hole and Face Grinder, 1944
#5 Bryant Internal Grinder, 1944
#5 Bryant Internal Grinder, 1943
4T Sellers Tool Grinder, 1942
#2 Cincinnati Centerless Grinder, 1937
#701 Habco Top Grinder, 1942
Nimo Centerless Grinder, 1935 Approx.

DRILLS

#2 LMS Leland Gifford Deep Hole Drill, 1942
4 Station Kingsbury Drill, Older, #18 Heads

LATHES

#4 Gisholt Universal Turret Lathe, 1942
Ostor Rapid Turret Lathe, 1943
#8 Lo-Swing Prod. Lathe, 1943 & 10x42 LR—8-36 Lo-Swing Prod. Lathe, 1944
Lipe Railway Production Lathe, 1942
16x72" Sebastian Engine Lathe, 1943
22x72" Axelson Engine Lathe, 1937
918 Rivett Tool Room Lathe, 1942
Bullard Multi-Matic, Type "A", 6 Station 16", 1927

MILLING MACHINES

1-H K & T Horiz. Milling Machine, 1942
08 Cincinnati Vertical Mill, Rotary Table, 1943
TG-36 Lees Bradner Thread Mill, 1943
Hall Planetary Thread Mill, Type "D", 1944
Taylor Finn Spline Mill, 1942
#2 Ohio Universal Milling Machine, older
6x15 Hansen Whitney thread mill, 1941

GEAR MACHINES

#3 Fellows Gear Shaper, 1940
#8 Fellows Fine Pitch Gear Shaver, 1936 (2)
GG-19 Detroit Gear Grind Machine, New 1944, Never used
12" Red Ring Gear Shaver, 1940
#18 Gleason Gear Grinding Machine, 1947

MISCELLANEOUS

16" Queen City Shaper, Factory Drive
Shaver Polishing Lathes (2) 1942
Lehomadou Double End Polishing Lathe, new, Shp.
Sunnen Hone, Model MA, 1942
Peerless Hack Saw, 1941, Model 9 x 9
28 Camball Abrasive Cut Off saw, 1942
P4 Ferracute Press, 1927
Foster Superfinisher, 12 Flat Surface, 1936
#56 Sundstrand Centering Machine, 1947
6000 Lb Fork Lift Truck, Clark, 1944, High Lift
Air Compressor, 1 HP Older
Atomic Welders, 1943, (5)
Sheffield Gauges, 500 Series, 1942 (5)
Continuous Chain Broaches, 5 Ton, 1936 (3)
5 Ton 54' Span Cab Operated Northern Crane
3 Ton 37' Cab Operated Northern Crane
Porter cable model G8, wet dry belt sander, 1942
No. 15 Gleason quenching presses, 1942 (No. 2)

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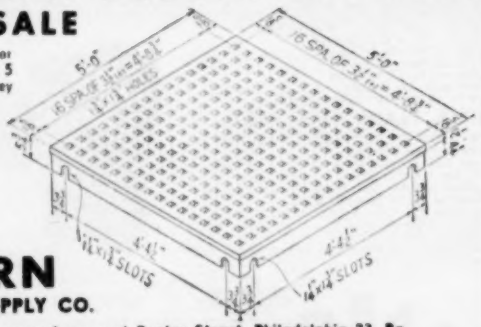
BENDING BLOCKS or SLABS FOR SALE

These blocks or slabs are 5 ft. x 5 ft. as shown. They are very useful for many purposes, such as for bending tables, layout, welding and assembly - work, etc.



ACORN IRON & SUPPLY CO.

Delaware Avenue at Poplar Street, Philadelphia 23, Pa.

MACHINE TOOLS AVAILABLE

Brand new Cincinnati #2MI Universal Milling Machine. many attachment.
Brand new Cincinnati 24" Heavy Duty Universal Shaper.
Pratt & Whitney 12" Model B Vertical Shaper (1943).
Jones & Lamson #TG-815 Automatic Thread Grinder (1944).
Cincinnati #1-18 Production Milling Machine (1942).
Cincinnati #2-24 Rise & Fall Milling Machine (1942).
Cincinnati #45-80 Hydromatic Milling Machine (1942)
Bullard 54" Vertical Turret Lathe (1942)
Lipe 12"x18" Carbo Lathe (1941).

All machines fully guaranteed

COASTAL MACHINERY CO.
1775 B'way, New York, N. Y.
Circle 6-8164

→ SCARCE MACHINE TOOLS ←

NILES 10' Vert. Boring Mill, 2 Heads, M.D.
INGERSOLL Planer Type Mill, 4 Heads, 36" x 24" x 20'
CINCINNATI 36" x 36" x 16' Planer, M.D.
WOODWARD & POWELL 42" x 42" x 36' Planer, M.D.
HEALD #81 Centerless Internal Grinder
HEALD #22 Rotary Surface Grinders

National Machinery Exchange
138 Mott St. New York 13, N. Y.
"If It's Machinery, We Have It"

GRINDERS: Heald No. 73 Internal Centerless, S/N 17099. Heald No. 74 Internal Centerless S/N 24602. These two grinders are in excellent condition and are equal to new. Cinn. 1½ Cutter Grinder S/N A-612T w/extra attach's.

COLD HEADERS: No. 3 Waterbury Farrel Triple Stroke Open Die Toggle Header, S/N 23508: 3/16" Asa S. Cook Single Stroke Open Die Crank Header: S/16" Asa S. Cook Single Stroke Open Die Crank Header. S/N 365.

THREAD ROLLERS: No. 20 Waterbury Farrel Horizontal Hand Feed S/N 215: ½" cap. Nat'l. Hyd. Hor. Hand Feed, 22 sets New Thread Roll Dies, Std. Sizes, 1944.

ED SMITH MACHINERY SALES
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VA 2-4830

BROWN & SHARPE Automatics (several)
#12 Martin Hydraulic Marking Machine, M.D.
#3 LODGE & SHIPLEY Duomatic Lathe
BAIRD Cut & Carry Drawing Press
4" RICE BARTON SPLINE MILLER
20" HENDEY Heavy Duty Shaper (Singular)
22x8x12" ABRASIVE SURFACE GRINDER
DIAL FEED POWER PRESSES
SHELL THREAD ROLLERS

Numerous Other Machine Tools

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OUTSTANDING MACHINE TOOLS

AUTOMATIC SCREW MACHINES
GYROMATIC Model 40 15/8" 6 spindle Late.
CLEVELAND 3¾ Model A

BORING MILLS—Horizontal
FRANKLIN 4½" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS #36 floor type; 3½" bar; M.D.
LUCAS #41; 5" Bar; table type; P.R.T. Late
NILES 6" bar; floor type, motor drive
UNIVERSAL; 3" Bar; table type; Late.

BORING MILLS—Vertical
BETTS 120" 2 heads P.R.T.; M.D.
BULLARD 8', 16" 6-spindle "A" Mult-au-matic
COLBURN 72", 2 heads PRT. M.D.
NILES 100", 2 swivel heads; motor drive
NILES 53", 2 swivel heads, motor drive.

BRAKES & SHEARS
BESCO 14 gauge 60" Press Brake; NEW.
BESCO 14 gauge 72" Press Brake; NEW.
BESCO 36", 16 gauge Foot Shear; NEW.
BESCO 36", 20 gauge Power Sq. Shear; NEW.
BESCO 48", ¼" gauge Power Sq. Shear; NEW.
BESCO 48", 16 gauge Power Sq. Shear; NEW.
BESCO 48", 14 gauge Power Sq. Shear; NEW.
BESCO 72", 14 gauge Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
CHAMBERSBURG 600 HP, Billet Breaker; late type.
JAMES KENNIE No. 8, Univ. Ironworker; late type.
NIAGARA No. 116 Squaring Shears; late type.
QUICKWORK No. 5 ¾" rotary, M.D.
QUICKWORK No. 6, 1" capacity; motor drive.
WORMSER T-15; T-23; Univ. Ironworker; NEW.

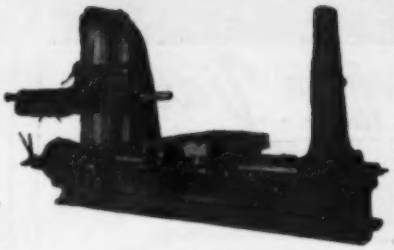
BROACHES
CINCINNATI 1-20 Duplex Vert. Hydr.
COLONIAL V.G. 1-10-48; Vert. Hydr. late.

DRILLS—Radial
CARLTON 3'6" Motor on Arm
CINCINNATI BICKFORD 6'18" Univ.; M.D.

DRILLS—Miscellaneous
AVEY No. 3, Ball bearing, Motor drive.
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; inverted; late
BARNES H-3 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back, Late
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.
FOOTE-BURT, 6 spindle, late type.
LeBLOND No. 2, deep hole, late type.
LEMAIRE, 5 spindle, late type.
MOLINE 6-spindle Hole-Hog 5⅝"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Roundere; M.D.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 422, 7A, 7, 7A, 72, 77 High Speed Gear Shapers; late
FELLOWS 13-LS Lapper; late
GLEASON #26 Tester Late Type
GLEASON 24" straight chi. gear gen.; M.D.
GLEASON #13 bevel cutter-grdr. M.D. late type
GLEASON 18" bev. gear Tester & Lapper; M.D.
GLEASON #4 Revacycle. Late type.
GLEASON No. 12 Tool Sharpener; late
GLEASON 12" Straight Bevel Gen.; late
GLEASON #4 & #6 Tester, Late Type
GLEASON 10", 11" & 12" Bevel Gear gen.
GLEASON 24", 27", 77", 96" Bev. Gear Planer
GLEASON No. 14 Hypoid Grinder; late
MICHIGAN Gear Finisher, Model 363-34-A, 24" cap. Late Type.
PRATT & WHITNEY 10" Gear Grinder; late

GEAR HOBBERS
BARBER COLMAN #12 Motor Drive
GOULD & EBERHARDT #18H, Motor Drive.
GOULD & EBERHARDT #36 H; Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KORTTER WM-11 Auto.; bench type; Late
PFAUTER R81; Max. dia. 36" late



LUCAS #41 Horizontal Boring, Milling and Drilling Machine, 3" bar; late type.

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x72 Model EM Plain, Late
LANDIS 16x36" Type C Plain, Hydr. Late type.
LANDIS 10x36" Type C Plain, Hydr. Late type.
LANDIS 10x18" Type C; late type
LANDIS 4"x12" Type H, Plain; Late.
LANDIS 36" x 240" Plain cyl., M.D.
NORTON 10x72; type C; plain; M.D.
NORTON 10x120; plain; M.D.
NORTON 14x56" plain; late.

GRINDERS—Surface
ARTER 9" Rotary, M.D.
BILLITTER & KLUNZ 48"x196" Way Grinder
HEALD #22 Rotary, 13" chuck; m.d. Late
PRATT & WHITNEY 14x36" Model B, Late
TAFT PIERCE 6" Rotary, M.D.
THOMPSON 2V Special; late type.

GRINDERS—Misc.
BRYANT No. 3 Internal; hydraulic; late
BRYANT No. 5 Internal; hydraulic; late
BRYANT No. 16-C-16 Internal; hydraulic; late
BRYANT No. 16-CP-16 Internal; hydraulic; late
BRYANT No. 24 Internal; hydraulic; late.
BACELLO #45 Carbide Late
HEALD 65A, special internal; late type.
HEALD No. 72-A-3 "Gagematic" int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
HEALD 72-A-3, 72-A-5 Plain; motor drive
HEALD No. 75 Internal Centerless; M.D.
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

HEADS AND UPSETTERS
ACME 2" Model XN, late type
AJAX 2½" Upsetter, motor drive
MANVILLE #9 DSOD, Motor Drive,
MANVILLE #2 DSOD, Motor Drive,
MANVILLE #1A, DSSD, Motor Drive
WATERBURY FARREL #11, DSSD, M.D.

LATHES—Engine & Mfg.
AMERICAN 26"x30" centers geared heavy
DENHAM 16x48" centers, Gap; late type
DENHAM 12x54" centers, Gap; late type
DENHAM 16x72" centers, Gap; late type
GRAHAM NORMANTON 12"x48" centers; late.
HENDEY 12"x54" centers, belted motor drive.
JONES & LAMSON "FAY" 20x25" Auto. Late
LEHMANN 16"x30" Hydratrol; late type.
LEHMANN 25x96" center; Timken; grd. M.D.
LeBLOND 16x36" center; Auto.; Timken; late
LeBLOND Mod. 7AUL Crankshaft; M.D.
LODGE & SHIPLEY 14"x30" Centers, late type.
LODGE & SHIPLEY 16"x30" Centers, late type.
LODGE & SHIPLEY 24"x96" centers; Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 14"x42" type Z, Magnamatic; late
NILES 80"x40', 80"x60' Boring; "Time-Saver"; Timken; Late
PRATT & WHITNEY 16"x30", Timken; late
REED-PRENTICE 14"x54", Timken; late type.
SPRINGFIELD 16"x30" Centers, Timken; late
SPRINGFIELD 14'x42", geared; M.D.
SUNDSTRAND 16x40" Auto. Late Type
SWIFT 16"x72" Centers, M.D. Late
SWIFT 20"x120" centers; late.

LATHES—TURRET
MOREY No. 2 ram type TIMKEN
GISHOLT 13, Saddle type, M.D.
MAGDENBERG Model MWF-BG-240 Univ. table type; P.R.T.; 12" hole through spindle; cross sliding turret; M.D.; Late
WARNER & SWASEY 4-A, Timken Bearing, 7½" Bore, motor drive.

MILLING MACHINES—Pl. & Univ.
BROWN & SHARPE #2B Timken; M.D.
CINCINNATI #3 Plain, hi power Timken; M.D.
KEMPSMITH #2 Timken; Univ. M.D.
CINCINNATI 4-48, 4 spindle, Tracer; Late
ROCKFORD Rigid-Mill #3 M.D.
STARR No. 2, table 13"x55"; late.
RICHMOND #2, light, late type.
VAN NORMAN #12 universal; late type

MILLING MACHINES—Mfg.
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x13' Adj. Rail Slab; M.D.
SUNDSTRAND Mod. 3A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type
LEES BRADNER HT 12"x24", M.D.; Late
LEES BRADNER HT 12x36" M.D.; Late
MOREY 12x30" centers, 12x120" centers, late
PRATT & WHITNEY 4½x12 Mod. C; late

PLANERS
BETTS CONSOLIDATED 108" x 84" x 44" 4 heads; PRT; Box Table; M.D.
GRAY 24x24x8'; motor drive.
GRAY 36"x36"x10', 4 heads PRT. Late.
LIBERTY 144"x76"x48" adj. variable, openside, box table; 4 heads, PRT; M.D.
NILES 108"x84"x42" 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x36' 4 hds. Rapid Traverse; M.D.
NILES-BEMENT-POND 60" x 60" x 12', Rapid Traverse, 2 swivel heads, box table, M.D.

SAWS
CAMPBELL #491 Abrasive cut-off. Late.
ESPEN LUCAS No. 670 30" cap Hydr.; Late.
GROB OS-20 metal band saw & filer; late.
HELLER Model SS-1, 6¾ Cap Cold Saw.

SHAPERS—SLOTTERS
DILL 16" Slotter; motor drive.
PRATT & WHITNEY 6" Vertical; M.D.
PRATT & WHITNEY M 1251 10" Vert., M.D.
LYND FARQUHAR 24" Openside; M.D.
NEWTON 16" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late Type.
ROCKFORD 24" Hydraulic; late type

PRESSES
BESCO EB 2 Power Punching; NEW
BESCO EB 3 back flywheel; NEW
BESCO B-4; back flywheel; NEW.
BESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
BIRDSBORO 125 ton Vert. Hydr; Late
BLISS #6 SS DC 135 ton; 34"x95" bed; 3½" stroke; 60 SPM.
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
BLISS No. 3½A geared toggle; dble. acting
GLEASON 18" Quenching; hydr.; M.D.
HANNIFIN 6-ton, 16-ton; hydr. Late.
NATIONAL #2 H.S. Maxi-Press (Forging)
SHORE, 600 ton Hydr. Flanging & Forming
TOLEDO #98 Straight Side DC 113 ton; 33"x 104" bed; 8" stroke; 70 SPM.
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
CROSS #45 Tooth Gear Chamfering Machine
FISCHER No. 1, Oil Groover; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
HUGH SMITH 1"x24'6" Plate bend. rolls M.D.
LANDIS 2" Dble. Spdle. Threaders; M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late
MANVILLE No. 5 Trimmers; Late
MANVILLE No. 8C Thread Roller; M.D.
SAUNDERS 6-18" Pipe Machine; M.D.
US TOOL 810-C Cutter Reliever; Late
WATERBURY FARREL No. 11 Thread Roller

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NORTON 23"x72" Plain Cylindrical Grinder 1943

CINCINNATI 10"x48" Plain Cylindrical Grinder, Servo infeed 1941

CINCINNATI 10"x36" Plain Cylindrical Grinder, Servo infeed 1942

HEALD 25A 24" Rotary Surface Grinder with chuck 1941

DRILLS

NATCO 85 Multi-Drill Tapper 14 Spindle Size #1 MT 1941

AVEY #3 MA6 Six Spindle Drill Press Hand Feed 1941

LATHES, ENGINE AND PRODUCTION

GISHOLT #5 Ram Type Universal with Air Chucking 1943

BARDONS AND OLIVER No. Ram Type Turret Lathe 1942

LODGE AND SHIPLEY Model 3A Duomatic, 1946

SENECA FALLS Model R-14 Low Swing Lathe 1942

LEBLOND 17"x72" Centers Regal Lathe 1941

DENVER 6 2 Air Chucking 1942

MILLS

BROWN & SHARPE Model 28 High Speed Plain 1938

HACK Multi-Versal with Attachments 1945

No. 3 PLAN-O-MILL Thread with Extras 1945

GEAR EQUIPMENT

FELLOWS 61A Gear Shapers 1941

PRATT & WHITNEY 10" Hydraulic 2 wheel Gear Grinders (2) 1941

GLEASON No. 12 Tool Sharpener 1944

MISCELLANEOUS

NATIONAL 4" Upsetter Suspended Slides Back Stop

SOUTHWARK 20'x1" Pyramid Type Bending Roll Drop End Balance Bar

HORTON No. 26 Hyprolaps 1942 and 1938

AMERICAN U2-6 Broach 1945

BAKEWELL No. 1 Tapper 1941

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BORING MILL 4" bar P & H. Floor Type
BORING MILL, 42" Gisholt, 2 Hds., M.D.
BORING MILL, 24" Bullard, New Era, Rebuilt
BORING MACH., 2" Bar Lees & Lambert (2)
BROACH, Nos. 1 & 3 Lapointe
DRILLS, RADIAL, 4' Western, M.D. (2)
6' Amer. 15" col. Trip. Pwr., 4-sp-arm
4'15" col. Carlton, 4-sp-arm, Late
5 Niles #10 Rigidtop, Univ., Motor on arm
3' Amer. 14" col. Trip. Pwr.
DRILL, 24" Cincl. Elek., Tapping, M.D.
DRILL, No. 121 Baker, M.D.
DRILLS, 16 Spin. Natco, G15-B
DRILLS, 21" Royerford Ensminger M.D. New
GEAR HOBBER, No. 5000 Gould & Eberhardt
GEAR HOBBER, No. 12 Barber Colman
GEAR HOBBER, No. 8000 Gould & Eberhardt
GEAR PLANERS, 11" Bloomfield Bevel
GEAR SHAPERS, Nos. 6, 06A, 06 & 07A
GEAR SHAPER, No. 75 Fellows
GEAR CUTTER, No. 12 B. & S. Spur & Bevel
GRINDER, FACE, 54" Builders, 40 h.p.
GRINDER, 16Y48 Bryant Int., 1943
GRINDER, Micro Internal, large capty.
GRINDER, No. 75A Heald Internal
GRINDER, SURFACE 14"x30" P. & W.
GRINDER, No. 6T Sellers Tool 1942
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATERS, No. 5 Baker capty. 4"x30" M.D.
LATHES, 42"x30' cen. Putnam Grd. Hd., M.D.
LATHES, 36"x22" cen. Bridgeford, 2 carr.
18"x12"x48" Harrington Gap, M.D.
12"x8' Hendey Grd. Hd., T.A., '42
24"x48"x13' bed Fay & Scott Gap M.D.
24"x20' cen. Putnam 2 carr. T.A. M.D.
20"x12' Bed R. & E., T.A., Grd. Hd.
18"x10' bed L. & S. T.A. Cone Motorized
16"x8' bed L. & S., Gelested Grd Hd., M.D.
14"x96"x20' cen. Monarch M.D.
10"x24" Model 200 Logan
TURRET LA., 21" Acme Universal Brass, late
20" Libby "O" 6½" capty.
No. 2B Foster Univ., 3½" capty., Bar Timken
No. 1B Foster Univ., 2" capty. M.D.
No. 681 Oster 1½" New
SAL Gisholt, 6½" H.S.
No. 3 Gisholt, '42 (5)
MILLER, No. 5-48 Cincl. Hydromatic Pl. M.D.
TABLER, RADIAL, 56"x20"x20"
THREAD MILLER, 12" Barry Shields '42
MILLER, No. 4B B. & S. Plain M.D.
MILLER, No. 0 Sundstrand Rigidmil, Hand
MILLER, No. 1½B K. & T. Univ., Grd. Hd.
MILLER, No. 3 Cincl. Hel Power, Motorized
MILLER, No. 5 Cincl. Rect., Timken
MILLER, No. 4 Cincl. Univ. Hi Power, M.D.
MILLER, No. 3HM Sundstrand Rigidmil, 22" feed
MILLER, No. 2 Van Norman Ram, M.D.
PIPE THREADER, 2" Landis, Grd. Hd., M.D.
PRESS, 75% Bliss S.S., 9" stroke
PRESS, No. 54 Toledo S.S., Grd., 171 ton capty.
PLANER, 36"x36"x14' Whitcomb, 2 Hds., M.D.
PLANER, 28"x36"x12' Woodward, 4 Hds., M.D.
PLANER, 24"x24"x6' Gray, M.D.
PUNCH & SHEAR, No. 7 Hycross-Kling with coper, 1-3/16" in 1" plate, 0° angles.

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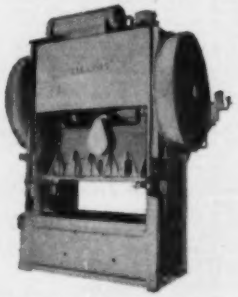

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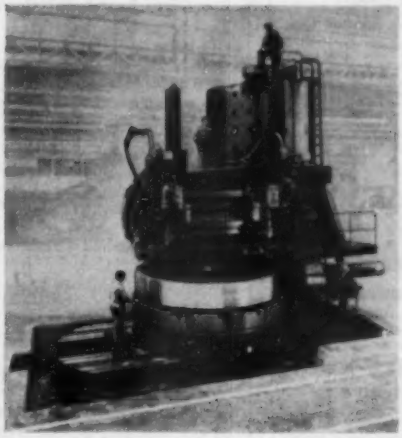

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42" BULLARD Spiral Drive Vertical Turret Lathe, Serial 24000, New 1945

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DRILLS

32" CINCINNATI BICKFORD Upright Drill
ES NATCO Multi. Spindle Drills—Hyd. table, 1942
No. 42S BAKER D.S. Heavy Duty Drill
No. 2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

No. 04 FELLOWS Gear Shaper
No. 725A FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 360M GOULD & EBERHARDT Gear Rougher

LATHES

13"x10" MONARCH "Air Gage Tracer" Mono-Matic Lathe
14"x8' bed HENDEY Mod. ECM, M.D. Eng. Lathe
16"x30" MONARCH Model C Engine Lathe, '47
20"x6' AMERICAN "PACEMAKER" Lathe
20"x10' LODGE & SHIPLEY Selective Geared Head Lathe
30"x10' bed AMERICAN "High Duty" Geared Head Lathe
42"x12' AMERICAN Geared Head Lathe.

GRINDERS

6"x18" LANDIS Type C Plain Grinder
8"x18" CINCINNATI Pl. Saddle Type Grinder
8x18" NORTON Vert. Spindle Surface Grinder
10"x72" LANDIS Type C Hyd. Plain Grinder, '42
#104 RIVETT Internal External Grinder
10/20 BRYANT Hyd. Internal Grinder
#73 HEALD Internal Centerless Grinders
TG-185 J&L Internal Thread Grinder
#55 HEALD Cylinder Grinder

MILLERS

No. 0-0 CINCINNATI (OT) Vert. Milling Machine
4½"x30" P&W Model C Thread Miller

AUTO. LATHES & TURRETS

No. 4D & 00 P&J Auto. Lathes
Nos. 3 JONES & LAMSON Ram Type Univ. Turret Lathe
No. 1NS LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1939
No. 2 BAS Wire Feed Hand Screw Machine
19" BETTS Vertical Slotter
⅛ P&W 2-spindle Reaming Machine
6" TAYLOR & FENN Spline Miller
20" CINCINNATI Hand Feed Rotary Table
P&W Upright Shaving Machine
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MONARCH Model N G.H. Engine Lathe 33½"x120" cc
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AMERICAN G.H. Engine Lathe 24"-27"x90" cc
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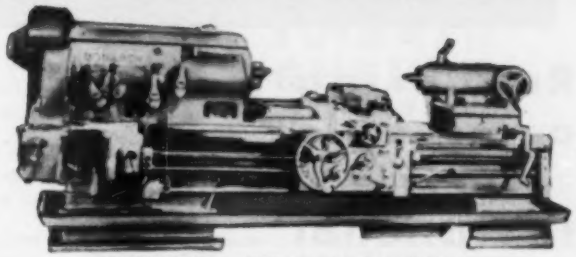
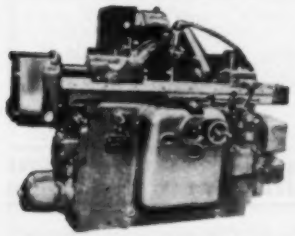
AMERICAN G.H. Engine Lathe 16"-18½"x30" cc
MONARCH Model ST Multi-Tool Mfg. Lathe 12"x18" cc
HARDINGE 2nd Operation Lathe 1" Cap.
CARROLL-JAMIESON 10"x18" G.H. 12-Speed Lathe



MONARCH 33½" x 120" ENGINE LATHE—MODEL N



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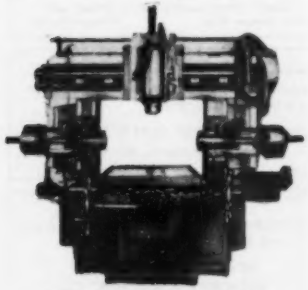

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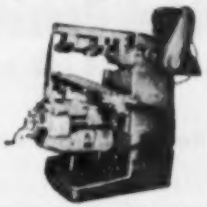

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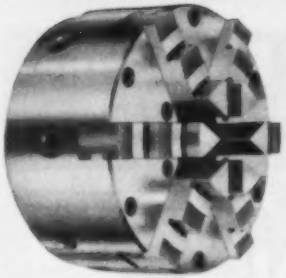

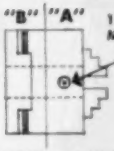

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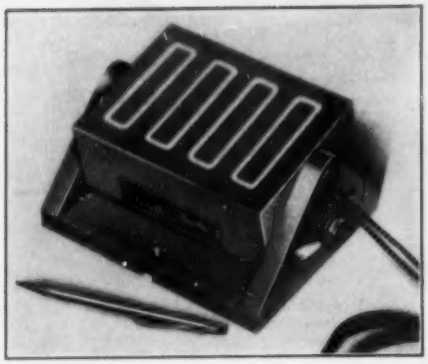

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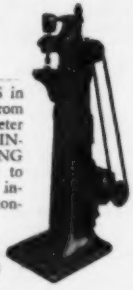

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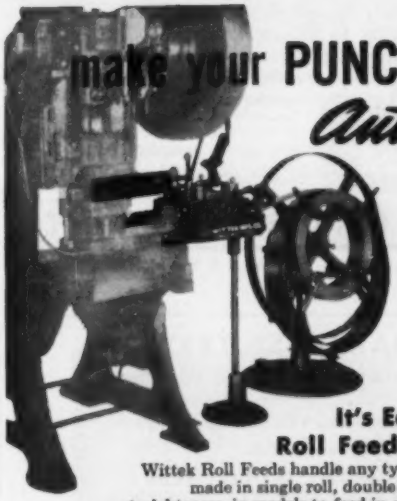

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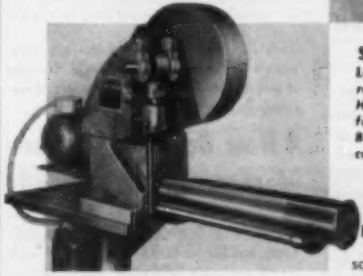
PROBLEMS!

Now you don't need to use *big* presses just to get *work* capacity. Benchmaster solves the problem with 4-TON HALF-PRESSES! Here are typical ways the HALF-PRESS cuts machine requirements:



SIZING SHELL CASE OPENINGS

Low tonnage, big vertical capacity is required. Note how the Benchmaster HALF-PRESS mounts on "I" shape frame, extending shut height to 18". Bolster is adjustable for various shell case lengths.

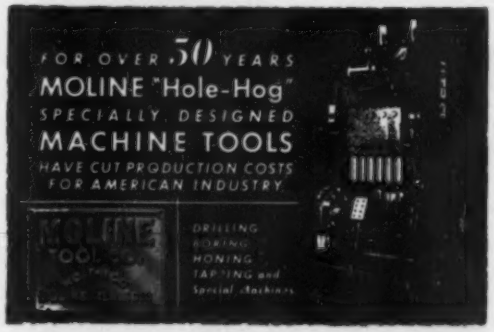
NIBBLING SHELL CASE ENDS—

Shut height of conventional press was insufficient to accommodate tooling and work. Benchmaster HALF-PRESS is mounted to special base carrying rotating pilot stop. Shell case is now quickly nibbled to exact length with low cost press.

If you have big capacity, small tonnage jobs, investigate Benchmaster HALF-PRESSES! Our engineering services will help solve your problems and show you how to save money. Write, describing your work requirements!

benchmaster
MANUFACTURING COMPANY

1835 W. ROSECRANS AVENUE, GARDENA, CALIFORNIA



Drilling and Reaming

388 KING PIN HOLES PER HOUR

Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

Davis and Thompson Roto-Matic

Davis & Thompson Company

2711 W. BURNHAM ST., MILWAUKEE 11, WISCONSIN

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What are PRODUCTION PROVED Dies?

Production proved dies save thousands of dollars—thousands of production hours for B. Jahn customers—every day!

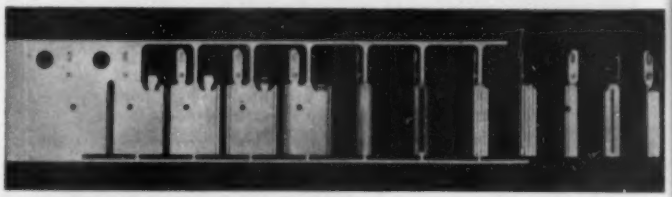
How are these tremendous savings obtained? By a few simple, honest words:

This B. Jahn built die is guaranteed to run in the customer's equipment to his complete satisfaction.

A simple guarantee — a simple statement of fact, but backed up by the additional promise to deliver a die strip and 10 or 50,000 PRODUCTION PROVED died parts or components for customer gauging, production use and approval.

Here is a positive method of eliminating all error, all chance, all uncertainty when you buy tools and dies.

Let B. Jahn's 165 designers, engineers and toolmakers put their 2475 years of experience to work for you.



Strip from 10 station progressive die built to produce Eversharp Shick Injector Razor Blade Holders. This strip and component parts were submitted to customer for approval.

50,000 Razor Blade Holders — being PRODUCTION PROVED in the B. Jahn plant. Progressive die produced 58 complete holders per minute, total run is to be millions.

Send for the story of B. Jahn PRODUCTION PROVED dies TODAY!

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Investigate B. Jahn and Invest in Production Economy!

PRODUCTION PROVED

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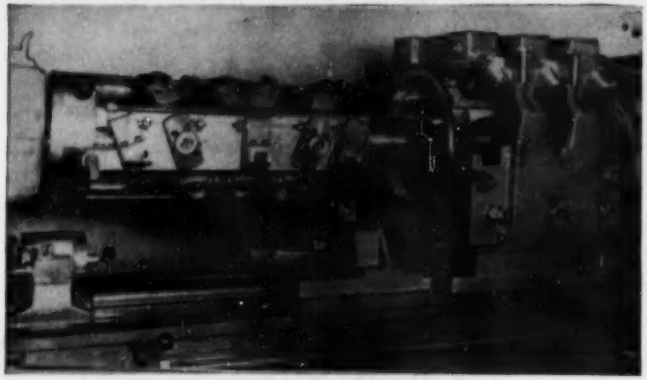
SAVE... TIME • MONEY MANPOWER!

. . . when machining PRESSURE CASINGS for JET ENGINES

ALFING Special

FINE BORING MACHINE



• **NO PRIORITY REQUIRED**

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Even unskilled labor can operate the Alfing with ease and efficiency!

A complete line of fine boring machines available. Write or phone for details!

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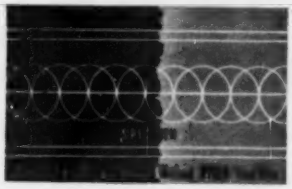
making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

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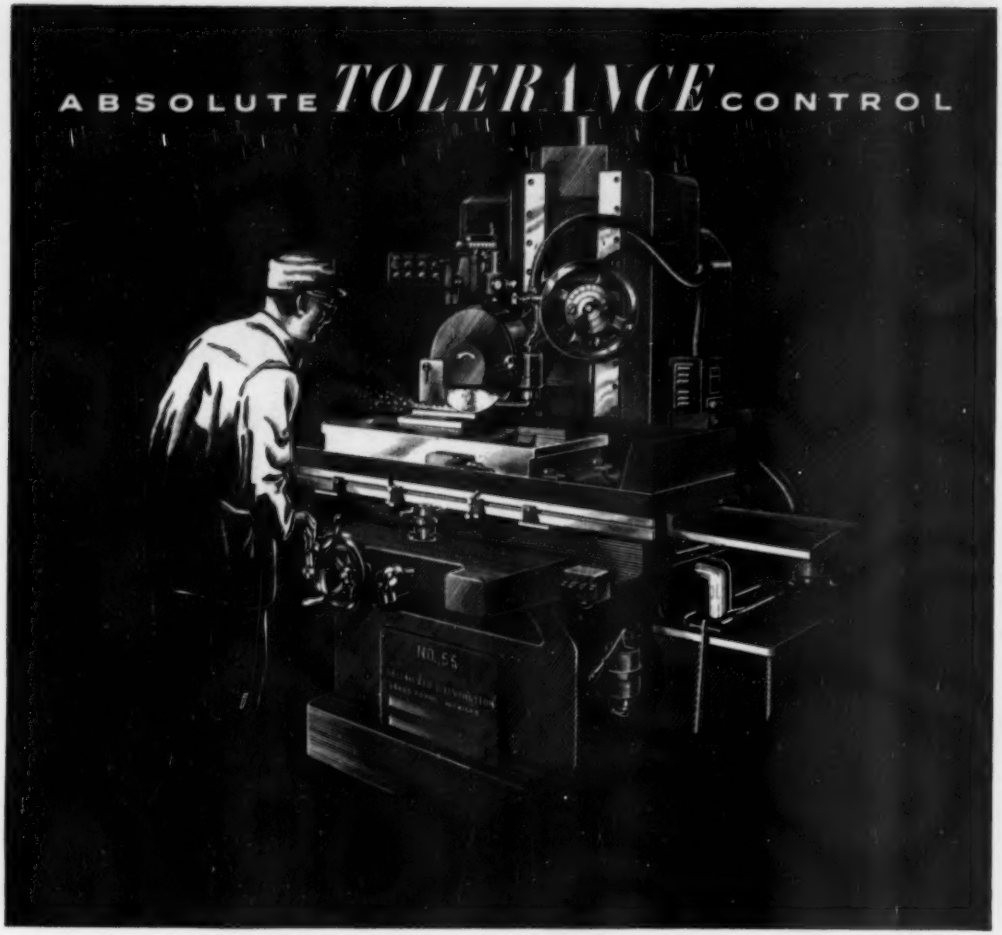

When job specifications leave no leeway, when extreme tolerances must be maintained . . . that's when the built-in precision and absolute tolerance control of Grand Rapids Grinders proves most valuable. Defense commitments make it impossible for us to fill your orders as rapidly as we'd like to . . . but we know our customers can appreciate the reasons for delay. As always, we're doing our best to serve you.

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Table of 42-ft. boring mill is centered on TIMKEN® bearings; runs true within .001"

THIS giant Consolidated vertical boring and turning mill is one of the world's largest. Its 20-foot table weighs 60 tons—can take a work piece up to 42 feet in diameter weighing 82 tons! Its table runs true within one thousandth of an inch!

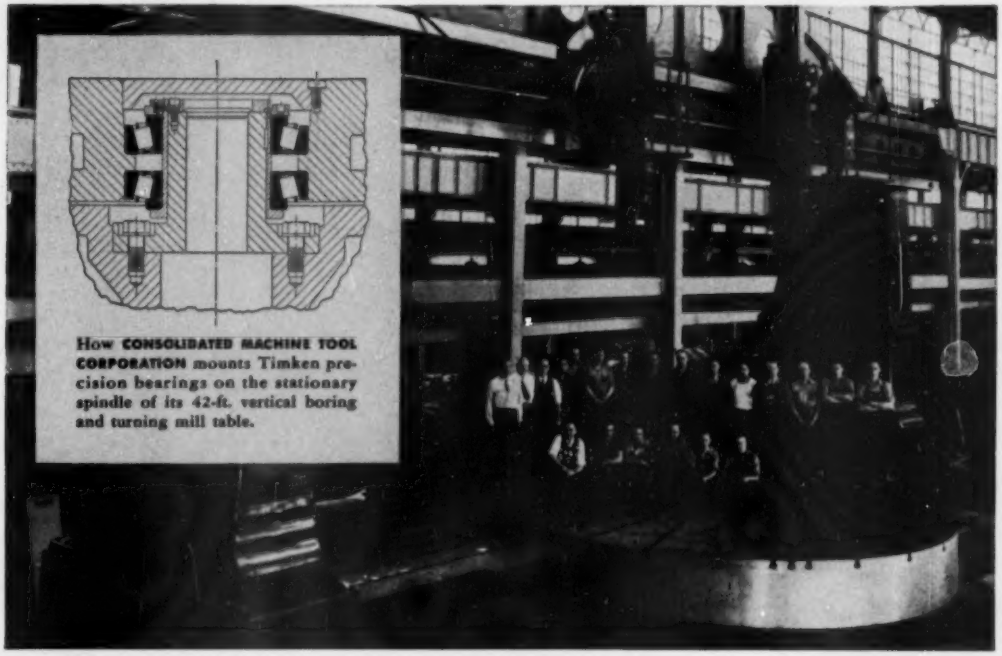
To make this amazing precision possible, Consolidated uses Timken® tapered roller bearings on the table centering spindle. These precision Timken bearings have high load carrying capacity resulting from line contact between rollers and races. Their tapered construction permits preloading. The result: deflection is minimized, long lasting accuracy is assured.

To help turn the total 142-ton load smoothly, Timken bearings are also used in the drive. They hold shafts in alignment, insuring accurate gear mesh, longer gear life.

Due to the ease with which Timken bearings can be set up, manufacturing costs are reduced. Auxiliary thrust bearings are eliminated, table maintenance is simplified.

No other bearing can offer you all the advantages of Timken bearings. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **CONSOLIDATED MACHINE TOOL CORPORATION** mounts Timken precision bearings on the stationary spindle of its 42-ft. vertical boring and turning mill table.

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Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

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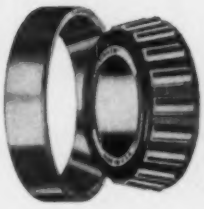

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